

(NASA-SP-7011 (264))	AEROSPACE MEDICINE AND	N85-11525
BIOLOGY, A CONTINUING BIBLIOGRAPHY WITH		
INDEXES (National Aeronautics and Space		
Administration)	103 p HC \$7.00 CSCL 06E	Unclas
	00/52	20564



## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)

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# **AEROSPACE MEDICINE AND BIOLOGY**

## **A CONTINUING BIBLIOGRAPHY WITH INDEXES**

**(Supplement 264)**

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in October 1984 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*



Scientific and Technical Information Branch

1984

**National Aeronautics and Space Administration**

Washington, DC

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 365 reports, articles and other documents announced during October 1984 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Six indexes -- subject, personal author, corporate source, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1984 Supplements.

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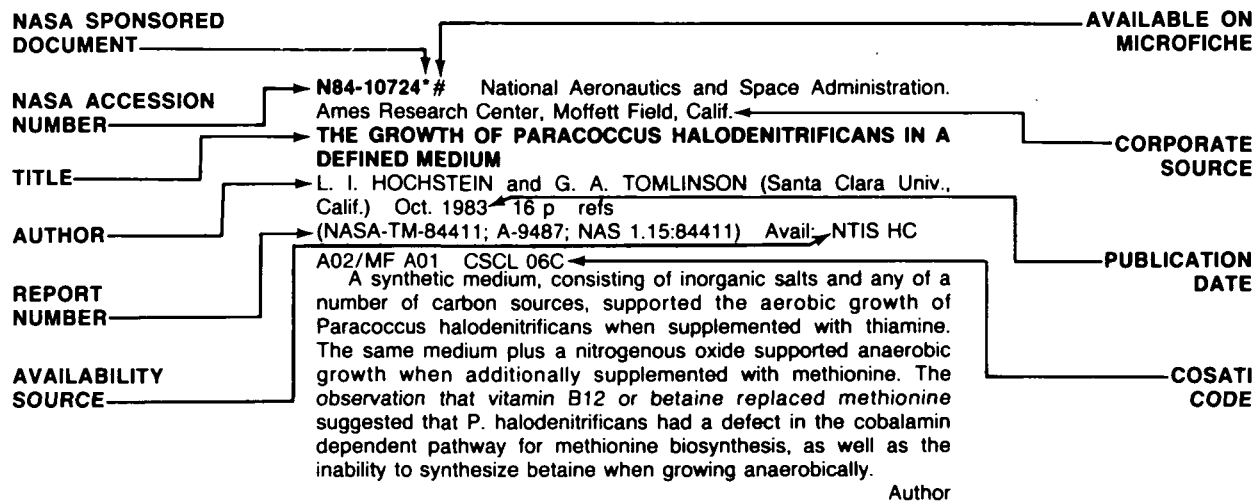
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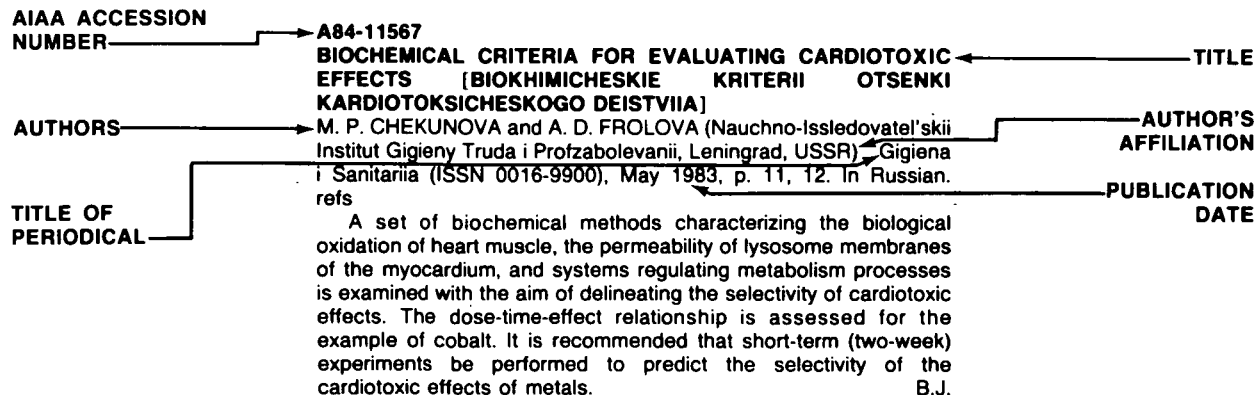
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# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 264)*

NOVEMBER 1984

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## LIFE SCIENCES (GENERAL)

Includes genetics.

**A84-39821\*** Houston Univ., Tex.

### **GROWTH AND DEVELOPMENT OF PLANTS FLOWN ON THE STS-3 SPACE SHUTTLE MISSION**

J. R. COWLES, H. W. SCHELD, C. PETERSON, and R. LEMAY (Houston, University, Houston, TX) *Acta Astronautica* (ISSN 0094-5765), vol. 11, May 1984, p. 275-277.

(Contract NAS2-11165)

Pre-germinated pine seedlings and germinating oat and mung bean seeds were flown on the STS-3 Space Shuttle mission. Overall, the seedlings grew and developed well in space. Some oat and mung bean roots, however, grew upward. Lignin content was slightly lower in flight tissues and protein content was higher.

Author

**A84-40124**

### **BRAIN METABOLISM AND ITS REGULATION IN CRANIOCEREBRAL TRAUMA [OBMEN VESHCHESTV V MOZGE I EGO REGULIATSIIA PRI CHEREPNO-MOZGOVOI TRAVME]**

M. SH. PROMYSLOV (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) *Moscow, Izdatel'stvo Meditsina*, 1984, 88 p. In Russian. refs

This monograph is concerned with disorders of the biochemical processes in the brain. It is shown that the basic metabolic process, which provides energy for the vital activity of the brain, undergoes abrupt changes in cases of craniocerebral trauma. A stimulation of the activity of the nervous system of injured animals promotes normalization of the energy metabolism in the brain. Respiration and oxidative phosphorylation in brain tissue are studied for the case of a craniocerebral trauma, and the activity of gamma-amylase and phosphorilase in the brain is investigated for the trauma condition. Attention is also given to the activity of monoamine oxidase under trauma conditions, the effect of craniocerebral trauma on the metabolism of N-acetyl-L-aspartic acid in the brain, and the metabolism of cystathionine and homocarnosine in the brain under trauma conditions.

G.R.

**A84-40128**

### **PHYSIOLOGY OF THE NEUROMUSCULAR APPARATUS OF THE LARYNX [FIZIOLOGIIA NERVNO-MYSHECHNOGO APPARATA GORTANI]**

B. S. KRYLOV, R. A. FELBERBAUM, and G. M. EKIMOVA (Leningrad, Izdatel'stvo Nauka, 1984, 216 p. In Russian. refs

The activity of the inner neuromuscular apparatus of the larynx during the performance of its respiratory and protective functions is examined. Attention is given to the sensational and motor innervation of the larynx, as well as to the electrophysiological characteristics of the activity of larynx nerves and muscles during the performance of the aforementioned functions. It is reported that there may arise compensatory-adaptive changes of the activity of the inner muscles of the larynx muscles, these changes being due to long-term changes in the conditions of the usual occurrence of this activity.

B.J.

**A84-40141**

### **REACTIVITY OF PLANT EXOMETABOLITES [REAKTSIONNAIA SPOSOBNOST' EKZOMETABOLITOV RASTENII]**

A. KH. TAMBIEV (Moscow, Izdatel'stvo Moskovskogo Universiteta, 1984, 72 p. In Russian. refs

An investigation is made of the physical and chemical properties of exometabolites, i.e., native water-soluble and dispersed excretions of higher and lower plants. Attention is given to the excretion characteristics of exometabolites, their significance in artificial and natural ecological systems, the relationship between the excretion of organic matter and the physiological condition of the plants, and methods for the analysis of exometabolite properties.

B.J.

**A84-40306**

### **RADIOBIOLOGICAL ADVANCED BIOSTACK EXPERIMENT**

H. BUECKER, G. HORNECK, R. FACIUS, G. REITZ, M. SCHAEFER, J. U. SCHOTT (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany), R. BEAUJEAN, W. ENGE (Kiel, Universitaet, Kiel, West Germany), E. SCHOPPER (Frankfurt, Universitaet, Frankfurt am Main, West Germany), H. HEINRICH (Siegen, Universitaet-Gesamthochschule, Siegen, West Germany) et al. *Science* (ISSN 0036-8075), vol. 225, July 13, 1984, p. 222-224. Research supported by the Bundesministerium fuer Forschung und Technologie. refs

The radiobiological properties of the heavy ions of cosmic radiation were investigated on Spacelab 1 by use of biostacks, monolayers of biological test organisms sandwiched between thin foils of different types of nuclear track detectors. Biostacks were exposed to cosmic radiation at several locations with different shielding environments in the module and on the pallet. Evaluations of the physical and biological components of the experiment to date indicate that in general they survived the spaceflight in good condition. Dosimetric data are presented for the different shielding environments.

Author

**A84-40308**

### **MICROORGANISMS IN THE SPACE ENVIRONMENT**

G. HORNECK, H. BUECKER, G. REITZ, H. REQUARDT (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany), K. DOSE, K. D. MARTENS (Mainz, Universitaet, Mainz, West Germany), H. D. MENNIGMANN, and P. WEBER (Frankfurt, Universitaet, Frankfurt am Main, West Germany) *Science* (ISSN 0036-8075), vol. 225, July 13, 1984, p. 226-228. Research supported by the Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt and Bundesministerium fuer Forschung und Technologie. refs

Preliminary results of the Spacelab I experiment on the response of *Bacillus subtilis* spores to conditions of free space are presented. Exposure to the vacuum of space on the Spacelab pallet reduced viability counts about 50 percent and increased mutation frequencies by a factor of about 10. Interpretation of apparent differences in the photobiological and photochemical data between flight and ground simulation experiments will require more statistical analyses and data from actual fluence measurements.

Author



A84-40309

**CELL SENSITIVITY TO GRAVITY**

A. COGOLI, A. TSCHOPP, and P. FUCHS-BISLIN (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 228-230. Research supported by the Eidgenoessische Technische Hochschule Zuerich; Swiss National Science Foundation. refs (Contract SNSF-3,034,81; SNSF-3,382,0,82)

Cultures of human lymphocytes exposed in microgravity to the mitogen concanavalin A showed less than 3 percent of the activation of ground controls. This result supports the hypothesis, based on simulations at low g and experiments at high g, that microgravity depresses whereas high gravity enhances cell proliferation rates. The effects of gravity are particularly strong in cells undergoing differentiation. Author

A84-40310\* Pennsylvania Univ., Philadelphia.

**CIRCUMNUTATION OBSERVED WITHOUT A SIGNIFICANT GRAVITATIONAL FORCE IN SPACEFLIGHT**

A. H. BROWN (Pennsylvania, University, Philadelphia, PA) and D. K. CHAPMAN (University City Science Center, Philadelphia, PA) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 230-232. refs

(Contract NGR-39-030-010; NGR-39-010-149; NAS9-15340; NAS9-15531)

For over half a century and especially since the 1960's a number of plant physiologists, seeking to explain the impressively ubiquitous mechanism that drives and regulates circumnutation in all growing plant organs, have been unable to agree on whether the differential growth process that leads to circumnutation oscillations is gravity dependent. There has been fairly general agreement that the question might be answered, if test plants could be deprived of all significant gravitational stimuli as would be possible in the near weightlessness or free fall environment of satellite orbit. Such an experiment was carried out during the Spacelab 1 mission. Circumnutation oscillations were observed which demonstrated that a protracted input of gravitational information from the environment was not required for initiation or maintenance of circumnutation in sunflower hypocotyls. Author

A84-40311\* New York State Univ., Binghamton.

**NEUROSPORA CIRCADIAN RHYTHMS IN SPACE - A REEXAMINATION OF THE ENDOGENOUS-EXOGENOUS QUESTION**

F. M. SULZMAN, D. ELLMAN, G. WASSMER (New York, State University, Binghamton, NY), C. A. FULLER (California, University, Riverside, CA), and M. MOORE-EDE (Harvard, University, Medical School, Boston, MA) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 232-234. refs

(Contract NAS9-15975)

To test the functioning of circadian rhythms removed from periodicities of the earth's 24-hour rotation, the conidiation rhythm of the fungus *Neurospora crassa* was monitored in constant darkness during spaceflight. The free-running period of the rhythm was the same in space as on the earth, but there was a marked reduction in the clarity of the rhythm, and apparent arrhythmicity in some tubes. At the current stage of analysis of the results there is insufficient evidence to determine whether the effect seen in space was related to removal from 24-hour periodicities and whether the circadian timekeeping mechanism, or merely its expression, was affected. Author

A84-40324

**BREAKDOWN OF CHIRAL SYMMETRY IN PREBIOLOGICAL EVOLUTION AND THE PHYSICAL CONDITIONS OF THE ORIGIN OF LIFE [NARUSHENIE KIRAL'NOI SIMMETRII V PREDBIOLOGICHESKOI EVOLIUTSII I FIZICHESKIE USLOVIA VOSTANOVLENIIA ZHIZNI]**

L. L. MOROZOV and V. I. GOLDANSKII Akademii Nauk SSSR, Vestnik (ISSN 0002-3442), no. 6, 1984, p. 54-63. In Russian. refs

Several possibilities for the construction of a standard model of the origin of life are presented on the basis of an analysis of

qualitative physical and chemical characteristics of the prebiological earth. Attention is given to the dynamics of breakdowns in chiral symmetry in biopoiesis, and to the physical factors affecting the orientation, populations and reactions of preorganic molecules. The application of theories based on the evolution of life on earth to the question of life elsewhere in the universe is also discussed.

I.H.

A84-40351

**A MODEL OF SPINAL CORD DYSBARISM TO STUDY DELAYED TREATMENT. I - PRODUCING DYSBARISM**

D. R. LEITCH (Institute of Naval Medicine, Gosport, Hants., England) and J. M. HALLENBECK (U.S. National Naval Medical Center, Naval Medical Research Institute, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 584-591. Navy-supported research. refs

This paper reports the development of a model of spinal-cord decompression sickness (DCS) which lends itself to studies of treatment in anesthetized dogs. Models tried early in this development could be used in the future to study blow-up and cerebral decompression sickness. It is found that a dive with a bottom time of 12-15 min at 300 ft breathing air and decompressed in 5.5 min produced a high incidence of cord DCS, as diagnosed by changes in spinal evoked potentials (SEP). Furthermore, the animals could generally be sustained on the surface using intravenous fluids, without going into shock, before treatment by compression was begun. The findings are discussed in the light of previous studies. Author

A84-40354\* SRI International Corp., Menlo Park, Calif.

**USE OF IMPEDANCE PLETHYSMOGRAPHY TO CONTINUALLY MONITOR BONE MARROW BLOOD FLOW**

L. D. MONTGOMERY, G. N. MCEWEN, JR., R. L. GERBER, C. E. CANN, and E. R. MOREY (SRI International Corp., Menlo Park, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 604-611. refs (Contract NAS2-9710)

An impedance-plethysmographic technique is described which can be used to quantify temporal bone-marrow blood-flow changes. Results obtained with the impedance technique compare favorably with the data from simultaneously administered microspheres. Injection of sympathomimetic drugs produced measurable responses: isoproterenol caused a significant increase in bone-marrow blood flow within 1 min, and levarterenol decreased bone-marrow blood flow. Data obtained with impedance plethysmography suggest that the technique is feasible for multiple measurements on the same animal and that the technique can be used to study acute or chronic changes in bone-marrow blood flow following various experimental treatments. Author

A84-40355\* Louisville Univ., Ky.

**A SUSPENSION MODEL FOR HYPOKINETIC/HYPODYNAMIC AND ANTIORTHOSTATIC RESPONSES IN THE MOUSE**

J. M. STEFFEN, M. J. DOMBROWSKI, X. J. MUSACCHIA, G. SONNENFELD (Louisville, University, Louisville, KY), A. D. MANDEL (NASA, Ames Research Center, Moffett Field, CA), and R. ROBB Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 612-616. refs (Contract NCC2-213; NSG-2325)

Hypokinetic/hypodynamic and antiorthostatic responses to weightlessness and bedrest were simulated in mice using a suspension technique. Animals were suspended for 1 or 2 weeks in an antiorthostatic posture and positioned to permit freedom of movement but eliminate load bearing by the hindlimbs. Suspended mice exhibited reduced food and water intakes and a rapid 10 percent decrease in body weight to a level which was maintained for the remainder of the suspension period. Diuresis was evident in suspended mice, but the natriuresis and kaliuresis previously observed in the suspended rat were not evident. Differential hindlimb muscle atrophy and increased excretion of urea and ammonia were also noted in suspended mice. Postsuspension recovery studies indicated that the recovery process was highly effective. These results document specific responses in the mouse

and similarities in the responses of mice and rats to suspension. These studies expand the utility of the suspension model and suggest that the mouse may be useful in future studies simulating both weightlessness and bedrest. Author

**A84-40356\*** Colorado State Univ., Fort Collins.

**EFFECT OF DIETARY VITAMIN E OR SELENIUM ON PROSTAGLANDIN DEHYDROGENASE IN HYPEROXIC RAT LUNG**

L. N. NORTH, M. M. MATHIAS (Colorado State University, Fort Collins, CO), and C. L. SCHATTE (NASA, Ames Research Center, Moffett Field, CA; Colorado State University, Fort Collins, CO) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 617-619. refs  
(Contract N00014-76-C-0437; NIH-HL-26753)

Weanling male rats were fed semipurified diets supplemented with 0, 60, or 600 IU/kg vitamin E or 0, 100, or 1000 ppb selenium. One group was injected daily with vitamin E at a rate equivalent to consumption of 60 IU/kg. Animals from all groups were sacrificed after exposure to normobaric oxygen or air for 48 h. Lung tissue was analyzed for the combined activity of prostaglandin dehydrogenase and reductase. Using the decline in enzyme activity as an indicator of susceptibility to oxygen poisoning, protection against hyperoxia was directly related to the level of vitamin E supplementation. Selenium supplemented at 100 ppb provided significant protection when compared to 0 ppb or 1000 ppb. The latter dose may have been marginally toxic. Thus dietary supplementation of vitamin E and selenium may influence the relative susceptibility of an animal to pulmonary oxygen poisoning. Author

**A84-40357**

**PREDICTION OF ARTERIAL WALL FAILURE UNDER ACCELERATION STRESS IN HIGH-PERFORMANCE AIRCRAFT**

P. D. MCCORMACK (U.S. Naval Hospital, San Diego, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 620-631. refs

The effects of aerial-combat maneuvers on human arterial walls are calculated on the basis of published animal data and a generalized model of arterial viscoelasticity which ignores smooth-muscle action and concentrates on collagen damage at high strain. Hysteresis is identified as the critical parameter, and a residual strain which decays exponentially over several hundred sec after stress is removed is characterized. Fractional-extension/acceleration and failure-limit curves are plotted at a maneuver repetition rate of 1/min for the external carotid, the pulmonary artery, and the abdominal aorta. For example, pulmonary-artery failure is predicted after 58 maneuvers at 5 g but after 10 maneuvers at 10 g. While anti-G suits and the use of the Valsalva maneuver can lessen collagen damage somewhat, gimbal crew capsules to reduce z-axis acceleration and continuous monitoring of individual acceleration exposure with integrating accelerometers are recommended. T.K.

**A84-40358\*** San Jose State Univ., Calif.

**OFF-VERTICAL ROTATION PRODUCES CONDITIONED TASTE AVERSION AND SUPPRESSED DRINKING IN MICE**

R. A. FOX, A. H. LAUBER, N. G. DAUNTON, M. PHILLIPS (San Jose State University, San Jose, CA), and L. DIAZ (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 632-635. refs  
(Contract NCA2-OR-675-801; NIH-SO6-RR-08192-02)

The effects of off-vertical rotation upon the intake of tap water immediately after rotation and upon conditioned taste aversion were assessed in mice with the tilt of the rotation axis varying from 5 to 20 deg from the earth-vertical. Conditioned taste aversion occurred in all mice that were rotated, but the intake of tap water was suppressed only in mice that were rotated at 15 or 20 deg of tilt. The greater suppression of tap-water intake and the stronger conditioned aversion in the mouse as the angle of tilt was increased in this experiment are consistent with predictions from similar experiments with human subjects, where motion sickness develops

more rapidly as the angle of tilt is increased. It was suggested that off-vertical rotation may be a useful procedure for insuring experimental control over vestibular stimulation in animal studies of motion sickness. Author

**A84-40426**

**INTERNATIONAL CONFERENCE ON THE ORIGIN OF LIFE, 7TH, MAINZ, WEST GERMANY JULY 10-15, 1983, PROCEEDINGS**

Conference supported by the Deutsche Forschungsgemeinschaft and Universitaet Mainz. Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, 857 p.

The topic areas of the present conference are cosmology and cosmochemistry, geology and geochemistry, the laboratory simulation of chemical evolution, the origin of biological information pertinent to the theory of the origin of life, energy conversion in biological evolution, and the extreme conditions encountered by life in space mission and exobiological conditions. Specific issues addressed include chemical evolution in a low temperature plasma, the evolution of the prebiotic atmosphere, flame- and the plasma-induced formation of bioorganic compounds in aqueous solutions, the abiotic synthesis of organic molecules from minerals containing traces of dissolved CO<sub>2</sub>, H<sub>2</sub>O, and N<sub>2</sub>, clays and other minerals in prebiotic processes, the early evolution of bioenergetic processes, parity violation as a source of chirality in nature, a structural theory for the origin of chirality, chiral versus chemical evolution and the appearance of life, the improbability of prebiotic nucleic acid synthesis, the genetic code and optimal resistance to the effects of mutations, a simple model for the evolutionary emergence of novel properties, anaerobic life at extremely high temperatures, dissimilar rates in molecular evolution, the origin of photosynthesis, and future ESA missions in biology. O.C.

**A84-40427**

**EVOLUTION BETWEEN CHEMISTRY AND BIOLOGY**

P. SCHUSTER (Wien, Universitaet, Vienna, Austria) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 3-14. Sponsorship: Fonds zur Foerderung der wissenschaftlichen Forschung. refs  
(Contract PROJECT FFWF-3502; PROJECT FFWF-4506)

The period of 1.1 billion years which spans the transition from prebiotic chemistry to prebiotic life has been addressed by model studies which suggest mechanisms leading from small, energy-rich molecules to replicating polymers, thence to translation and the origin of the genetic code, and finally to compartment-formation. These models differ with respect to the time-ordered sequence of these events, but they do not deny the steps' fundamental importance. Information on prebiotic molecules can be obtained from backwards extrapolation of sequences from present-day biopolymers. Interesting data have recently emerged from large scale comparison of genetic sequences in DNA and RNA. Attention is given to polynucleotide replication. O.C.

**A84-40458**

**EVOLUTION OF BIOCATALYSIS. I - POSSIBLE PRE-GENETIC-CODE RNA CATALYSTS WHICH ARE THEIR OWN REPLICASE. II - NICOTINAMIDE AND/OR FLAVIN-CONTAINING RNA MOLECULES AS POSSIBLE PRE-GENETIC-CODE REPLICATING OXIDO-REDUCTASES**

C. M. VISSER (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 291-300. Research supported by the Rijksuniversiteit Groningen and Hollandsche Maatschappij der Wetenschappen. refs

The present investigation is concerned with a plausible scheme for pre-genetic-code evolution of self-replicating catalysts, independent of coded polypeptides. Possible compartments for phosphorylation reactions are considered along with possible prebiotic RNA replicases. It is found that the evolution of RNA molecules in both of their permitted helical forms seems to give rise to structures potentially capable of catalyzing replication of

RNAs in those helical forms. Possible transition states of NAD(P)H-dependent hydride transfer reactions are considered. It appears that such reactions would be catalyzed when the nicotinamide mononucleotide is part of an RNA double helix in the Z or A conformation. Similar conclusions are reached for flavin and deazaflavin mononucleotides as parts of similar helices. The possibility of a primitive chlorophyll-independent RNA catalyst for photoreduction of NADP(+) is considered. G.R.

**A84-40460****SOME ASPECTS OF THE ORIGIN AND EARLY EVOLUTION OF BIOENERGETIC PROCESSES**

Z. MASINOVSKY (Ceskoslovenska Akademie Ved, Mikrobiologicky Ustav, Prague, Czechoslovakia) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 315-322. refs

Model experiments demonstrating some possibilities of the primitive bioenergetics were performed. By comparing the catalytic properties of heme and hemoproteinoid in electron transfer reactions, it was shown that hemin acts as an active dark catalyst, whereas hemoproteinoid is a photosensitizer of these processes. The heme-containing enzyme peroxidase /or even the hemoproteinoid/ is also able to provide the phosphorylation of different substrates. It is proposed that the phosphorylation is initiated by a hydroxyl radical occurring in the peroxidase reaction. It is believed that those reactions could play a role in prebiotic energetics by coupling the electron transfer with the phosphorylation of suitable substrates. Author

**A84-40461****THE EVOLUTION OF PREBIOLOGICAL SELF-ORGANIZATION - PROBABLE COLLOID-CHEMICAL EVOLUTION OF FIRST PROKARYOTIC CELLS**

V. LIEBL, V. J. A. NOVAK, Z. MASINOVSKY, L. BEJSOVCOVA (Ceskoslovenska Akademie Ved, Mikrobiologicky Ustav, Prague, Czechoslovakia), and B. PACLTOVA (Karlova Universita, Prague, Czechoslovakia) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 323-334. refs

This is an attempt to analyse the mechanisms of self-assembly in the course of the origin and early evolution of life on the earth. A special attention is paid to the investigation of transient stages between the physico-chemical and biological bases of self-assembly, including experimental models and paleontological results. The theory of coacervate-in-coacervate is discussed from the point of view of evolution of first procaryotic cells. Many of the high developed structures of the contemporary cells, such as ribosomes, chromosomes, lipid membranes, some other organelles etc., are claimed to possess a rudimentary polyionic coacervate character. Author

**A84-40466****PARITY VIOLATION AS A SOURCE OF CHIRALITY IN NATURE**

L. KESZTHELYI (Magyar Tudomanyos Akademia, Biofizikai Intezet, Szeged; Magyar Tudomanyos Akademia, Kozponti Fizikai Kutato Intezet, Budapest, Hungary) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 375-382. refs

Recent experimental and theoretical investigations of the role of parity violation in the chirality of biomolecules are reviewed. Attention is given to studies refuting the model of Vester and Ulbricht (1959) which assumes parity violation to be the principal source of chirality in biomolecules. It is concluded that the small asymmetries produced by parity violation are not sufficient to induce optical purity in biomolecules, and that chirality could possibly be the result of random, spontaneous processes. I.H.

**A84-40467\*** Stanford Univ., Calif.

**EXPERIMENTAL EVIDENCE FOR BETA-DECAY AS A SOURCE OF CHIRALITY BY ENANTIOMER ANALYSIS**

W. A. BONNER (Stanford University, Stanford, CA) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 383-390. refs  
(Contract NGL-05-020-582)

Earlier experiments testing the Vester-Ulbricht beta-decay hypothesis for the origin of molecular chirality are reviewed, followed by descriptions of experiments involving attempted asymmetric radiolysis of DL-amino acids using quantitative gas chromatography as a probe for optical activity. The radiation sources included Sr-90-Y-90, C-14, and P-32 Bremsstrahlen, longitudinally polarized electrons from a linear accelerator and longitudinally polarized protons from a cyclotron. With the possible exception of the linear accelerator irradiations, these experiments failed to produce g.c.-detectable enantiomeric excesses, even at 50-70 percent gross radiolysis. Thus no unambiguous support for the Vester-Ulbricht hypothesis is found in any of the attempted asymmetric radiolyses performed to date. Radioracemization, a possible reason for these failures, is discussed. Author

**A84-40468****ORIGIN OF CHIRALITY - A STRUCTURAL THEORY**

M. SHIMIZU (Tokyo, University, Tokyo, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 397-404. refs

The molecular basis for the origin of chirality is presented. The complex of the anticodon bases and the discriminator base on a D type tRNA can recognize an L type amino acid. Exceptionally the D type tyrosine can be recognizable by the D type tRNA as shown by Calender and Berg. The advantage of such a stereochemical theory over the frozen accident theory is discussed. Author

**A84-40469****PARITY NONCONSERVATION AND THE ORIGIN OF BIOLOGICAL CHIRALITY - THEORETICAL CALCULATIONS**

R. A. HEGSTROM (Wake Forest University, Winston-Salem, NC) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 405-411. refs

Recent theoretical calculations concerning the hypothesized connection between the parity violating weak interactions and the origin of biological chirality are extended in order to assess the relative importance of differential beta radiolysis of enantiomers and the energy difference between enantiomers. It is found that the largest chiral polarizations are produced at lower temperatures where beta radiolysis dominates. At higher temperatures the energy difference between enantiomers dominates but the chiral polarization is appreciably smaller. Author

**A84-40470\*** Michigan Univ., Ann Arbor.

**BETA DECAY AND THE ORIGIN OF BIOLOGICAL CHIRALITY - NEW EXPERIMENTAL RESULTS**

J. VAN HOUSE, A. RICH (Michigan, University, Ann Arbor, MI), and P. W. ZITZEWITZ (Michigan, University, Dearborn, MI) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 413-420. refs  
(Contract NSG-7452; NSF PHY-81-07573)

The hypothetical connection developed by Vester and Ulbricht (1959), between the handedness of beta particles in radioactive decay and the (L) sign of biological chirality is investigated in a radiolysis experiment. The experiment measured the predicted asymmetry in the formation triplet or 'ortho-' positronium (oPs) in amino acid enantiomers by low energy positrons under conditions



of helicity reversal. The positrons were focused on amino acid powder samples. By measuring the time between positron arrival and emission of gamma rays, long-lived oPs were separated from other species. It is found that the asymmetry in leucine ( $0.8 \times 10$  to the -4th) is consistent with the theoretical prediction of 10 to the -6th. Neither the experimental limits nor the theoretical estimates are found to rule out a mechanism like that described by Vester and Ulbricht as the cause of the sign of the observed chiral polarization. I.H.

#### A84-40471

##### **SPECULATIONS AND FACTS ON THE POSSIBLE INDUCTIONS OF CHIRALITY THROUGH EARTH MAGNETIC FIELD**

W. THIEMANN (Bremen, Universitaet, Bremen, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 421-426. refs

Theoretical issues in the origin of chiral molecular structure in the biosphere are discussed, with special emphasis on the possible role of the earth's magnetic field in inducing chiral structures. A brief assessment is made of both pro- and contra-deterministic models of the origin of chiral molecules. The goal of such models is to determine whether the synthesis of L-amino acids was a purely chance event (as in the contra-deterministic model) or a necessary event reflecting the characteristic milieu of the prebiotic earth (as in the pro-deterministic model). An experiment is proposed in which a circularly polarized light beam is transmitted through a symmetric substance fixed between the poles of a powerful magnet, in order to simulate the effect of the earth magnetic field upon a prochiral (prebiotic) structure in chemical evolution. Diagrams of the experimental set-up are provided. I.H.

#### A84-40473

##### **CHIRAL VERSUS CHEMICAL EVOLUTIONS AND THE APPEARANCE OF LIFE**

G. SPACH (Rouen-Haute Normandie, Universite, Mont-Saint-Aignan, Seine-Maritime, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 434-437.

Several proposals are made in response to the need for a general investigation of chemical and configurational evolution of the major chiral biomolecules, in order to develop a better model of the origin of life. The characteristic features of chiral biomolecules found on earth today are briefly discussed, with emphasis on isoprenoid oligomers, coenzymes and vitamins which are not usually taken into consideration in evolutionary schemes. The research topics proposed include: the significance of remnant D-amino acids and L-sugars in antibiotic molecules; the exact rules for stereospecific interactions in amino acids, sugars, lipids and isoprenyl compounds; and the configurational complexities of nucleic acid ancestors, as they are represented in several glycerol phosphate esters. Some experiments for investigating these phenomena are described. I.H.

#### A84-40476

##### **METAL IONS AS A FACTOR OF FUNCTIONAL EVOLUTION AND OF DEVELOPMENT OF SOME IMPORTANT BIOCHEMICAL PROPERTIES IN PREBIOTIC AND BIOLOGICAL CONDITIONS**

N. BAKARDJIEVA (B'lgarska Akademiia na Naukite, Institut po Fiziologia na Rasteniiata, Sofia, Bulgaria) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 451-458. refs

Arguments are given why metal ions could be considered as a prototype or factor for the emergence of biologically important functional systems. The transmission of their properties to the considerably more complex metal-proteins and the prospect for new functional possibilities to emerge in the process of metal ions-protein linking are considered to be essential. A series of

mechanisms by which metal ions participate in the specialization and modification of the catalytic function, in the perfection of metabolic control, are displayed. Author

#### A84-40477

##### **THE PROBLEM OF TRANSITION FROM THE CHEMICAL TO THE BIOLOGICAL EVOLUTION - SOME POSSIBLE SOLUTIONS**

P. M. BHARGAVA and A. GAMBHIR (Centre for Cellular and Molecular Biology, Hyderabad, India) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 459-468. refs

On the basis of evidence that several low-molecular-weight substances as well as enzymes are compartmentalised within the so-called soluble phase of the cell, and other considerations, it is argued that DNA may not contain information for certain types of organisation found in living cells. It may be necessary for a cell to possess the 'non-DNA-controlled' organisation for performance of its minimum functions; such organisation would then also serve as a 'template' for its appearance in the daughter cell. The problem of transition from chemical to biological evolution (that is, the formation of the 'first cell') may be essentially the problem of emergence of such intracellular organisation for which information may not reside in DNA. Two possible mechanisms through which this may have happened are stated. Author

#### A84-40479

##### **SPECIFICITY OF PROTEIN-NUCLEIC ACID INTERACTION AND THE BIOCHEMICAL EVOLUTION**

S. K. PODDER and H. S. BASU (Indian Institute of Science, Bangalore, India) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 477-484. refs

The water soluble carbodiimide condensation of dipeptides of the form Gly-X was performed in the presence of mononucleotides and polynucleotides. The observed yield of the tetrapeptide was found to be higher for the peptide-nucleotide system of higher interaction specificity according to the anticodon-amino acid relationship. The yield of the condensation product of L-peptide was found to be higher because of its higher interaction specificity. The extent of racemization during the condensation of Gly-L-Phe, Gly-L-Tyr and Gly-D-Phe was found to be dependent on the specificity of the interaction. The resulting compound was shown to have a catalytic effect on condensation reactions. The data provide a mechanism for showing how the specific interaction between amino acids, dipeptides and nucleic acids can lead to the formation of a primitive translation machine. I.H.

#### A84-40480\* Miami Univ., Coral Gables, Fla.

##### **SELF-SEQUENCING OF AMINO ACIDS AND ORIGINS OF POLYFUNCTIONAL PROTOCELLS**

S. W. FOX (Miami University, Coral Gables, FL) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 485-488. refs (Contract NGR-10-007-008)

The role of proteins in the origin of living things is discussed. It has been experimentally established that amino acids can sequence themselves under simulated geological conditions with highly nonrandom products which accordingly contain diverse information. Multiple copies of each type of macromolecule are formed, resulting in greater power for any protoenzymic molecule than would accrue from a single copy of each type. Thermal proteins are readily incorporated into laboratory protocells. The experimental evidence for original polyfunctional protocells is discussed. C.D.

## 51 LIFE SCIENCES (GENERAL)

**A84-40481**

### **IS MATTER INANIMATE? - PROTOBIOLOGICAL INFORMATION FROM WITHIN**

K. MATSUNO (Nagaoka, Technological University, Nagaoka, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 489-496. refs

The characteristics of information are considered, taking into account an informing agent, an object to be informed, and a transmitted message. Shannon and Weaver (1949) assume that the object to be informed is a human receiver or observer. The information involved is then necessarily anthropomorphic. On the other hand, biological information allows two possibilities, including anthropomorphic and nonanthropomorphic information. Nonanthropomorphic biological information assumes that an agent to inform is the preceding products of biosynthesis and an object to be informed is the following production process. The message to be transmitted, which is embodied in the preceding products, is the boundary condition to the subsequent production. Attention is given to protobiological information, internal indefiniteness, constraint and variation, and questions concerning the inanimateness of matter. G.R.

**A84-40482**

### **MODEL APPROACH OF THE BREAKTHROUGH OF A TRANSLATION MACHINE AND THE ORIGIN OF THE GENETIC CODE**

U. LEHMANN and H. KUHN (Max-Planck-Institut fuer biophysikalische Chemie, Goettingen, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 497-504. refs

A model for a genetic apparatus which translates a sequence of nucleotides into a corresponding sequence of amino acids is proposed. The model begins with a condensation of monomeric nucleotides to strands containing 10 monomeric units. For longer strands, it is assumed that all monomers are linked in the correct way. The process of precise fitting of a nucleation unit, a collector strand and hairpin adapter strands is considered decisive in the functioning of the model. The model is expected to provide valuable information for developing a larger model of the origin of the genetic code. I.H.

**A84-40483\*** Alabama Univ., Birmingham.

### **THE CASE FOR THE ANTICODE**

J. C. LACEY, JR., D. W. MULLINS, JR., and M. A. KHALED (Alabama, University, Birmingham, AL) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 505-511. refs  
(Contract NGR-01-010-001)

The present paper will focus on developments related to the origin of the DNA code. Principally these items are: (a) a new set of correlations which include ranked hydrophobicities of amino acids and dinucleotides; (b) binding constants of Phe for the four mononucleotides; and (c) binding constants of Phe, Leu, Ile, Val, and Gly for polyadenylic acid (poly A). The data continue to support a model for the origin of the code based on relationships between amino acids and their anticodons. Author

**A84-40484**

### **PRESENT STATE OF THE COACERVATE-IN-COACERVATE THEORY - ORIGIN AND EVOLUTION OF CELL STRUCTURE**

V. J. A. NOVAK (Ceskoslovenska Akademie Ved, Mikrobiologicky Ustav, Prague, Czechoslovakia) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 513-522. refs

Various possibilities regarding the processes leading to the origin of life have been considered, taking into account proteins or related compounds as starting materials, the primary development of nucleic acids, a simultaneous origin of proteins and nucleic acids, and theories based on entirely different mechanisms. The coacervate-in-coacervate theory considered in the present investigation follows an approach discussed by Oparin (1924, 1957), and belongs to the first group of theories. The principal difference between the concept of coacervate-in-coacervate conception and Oparin's original theory is related to the assumption that primary coacervates of abiotically formed protein-like substances did not represent the actual beginning of life on earth. It represented rather a necessary 'culture medium' in which secondary coacervates originated around replicating molecules of nucleic acids. G.R.

**A84-40485**

### **ORIGIN AND EVOLUTION OF HEREDITY-METABOLISM SYSTEM**

M. SHIMIZU (Tokyo, University, Tokyo, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 531-538. refs

Some issues concerning recent models of ancient protein synthesis are discussed. Attention is given to defects in recent theoretical physical models, and a new (C4N) model is proposed which takes into account the role of physicochemistry in the evolution of heredity and metabolism systems. The model is based on the assumption that plant viruses and movable genes could be the fossil vestiges of the ancient protein synthesis system where tRNA = mRNA = gene. It is pointed out that the functional differentiation of proteins closely correlates with the structure of primitive tRNA. Some possible forms of primitive tRNA used by the earliest organisms are explicitly shown. It is possible that the system of primitive genes and primitive enzymes in the protocellular membrane (marigranules) might simulate the earliest organism. I.H.

**A84-40486**

### **PHYLOGENY OF TRANSFER RNA**

A. M. RODRIGUEZ-VARGAS (Stuttgart, Universitaet, Stuttgart, West Germany), J. E. FAJARDO, and B. C. RAMIREZ (Universidad de los Andes, Bogota, Colombia) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 547-555. Research supported by the Universidad de los Andes of Colombia. refs

Phylogenetic trees of transfer RNA specific for phenylalanine, methionine initiator glycine and valine are constructed. Although the exact relationships between taxa cannot be obtained from the mere analysis of the sequences some conclusions can be drawn about the evolution of this molecule. Author

A84-40487

**THE STRUCTURAL PERIODICITY OF E. COLI RIBOSOMAL PROTEINS**

O. CH. IVANOV (B'lgarska Akademiia na Naukite, Institut po Organichna Khimiia s Tsent'ra po Fitokhimiia, Sofia, Bulgaria), P. S. KENDEROV (B'lgarska Akademiia na Naukite, Institut po Matematika s Ischislitelnen Tsent'ra, Sofia, Bulgaria), and J. P. REVALSKI (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 557-564. refs

It is established that the sequences of all different proteins from E. coli ribosome as well as two protein biosynthesis initiation factors, two ribosome-associated DNA-binding proteins, and the elongation factor EF-Tu from the same source possess a periodicity expressed more weakly and differently from that found earlier for a number of proteins representative of 18 superfamilies. The statistical significance of the periodicity observed was checked by comparing the area below the periodicity curve of every protein examined with that of computer generated sequences having the same amino acid composition and length. The results concerning the proteins from small and large ribosomal subunit are compared. The conclusions support and supplement the concept about the presence of a trend in protein molecular evolution from universal (Gly, Ala) to specialized (Phe, Tyr, Trp, Cys) amino acids. Author

A84-40488

**THE IMPROBABILITY OF PREBIOTIC NUCLEIC ACID SYNTHESIS**

R. SHAPIRO (New York University, New York, NY) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 565-570. refs

In theories concerning the origin of life, the development of the first molecular system capable of self-replication represents a key step. Schemes considered by Eigen et al. (1981) depend critically upon the spontaneous prebiotic assembly of the first nucleic acid. In evaluating the probability for such an assembly, scientists have come to very different conclusions. The present investigation attempts to decide between opposing points of view, taking into account the ease of formation of the natural nucleosides and nucleotides, their stability, and the ability of the monomers to polymerize when surrounded by a host of competing substances. On the basis of a consideration of the existing chemistry of nucleic acid components, the conclusion is reached that the spontaneous formation of even a short nucleic acid chain under prebiotic conditions is a highly improbable event. G.R.

A84-40489

**TRNA-RRNA SEQUENCE HOMOLOGIES - A MODEL FOR THE ORIGIN OF A COMMON ANCESTRAL MOLECULE, AND PROSPECTS FOR ITS RECONSTRUCTION**

D. BLOCH, B. MCARTHUR, R. WIDDOWSON, D. SPECTOR, J. SMITH (Texas, University, Austin, TX), and R. C. GUIMARAES (Universidade Estadual Paulista, Botucatu, Sao Paulo, Brazil) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 571-578. Research supported by the Conselho Nacional de Pesquisas. refs  
(Contract NIH-GM-23331)

A model is proposed for the early evolution of the coding mechanism. A primordial RNA embodies the functions of today's nucleic acids in a single molecule. The molecule is generated by successive rounds of self-priming and -templating. After proximity is assured by enclosure in a cell, the functions can be partitioned among more efficient specialized molecules. The prediction of sequence homologies in later forms prompted a search for matches between t- and r-RNAs. These are described. Their distributions offer clues to their origins. The existence of overlapping homologies indicates an approach to the reconstruction of an ancestral molecule. Author

A84-40490

**GENETIC CODE AND OPTIMAL RESISTANCE TO THE EFFECTS OF MUTATIONS**

A. FIGUREAU and M. POUZET (Lyon I, Universite, Villeurbanne, Rhone, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 579-588. refs

This paper deals with the notion of resistance of the genetic code to the effects of mutations. The resistance of a group of t codons is measured as the number of pairs which differ from each other in only one of their three bases. For each value of t the maximum possible value of the resistance is found and some groups of codons giving this value are described. Important examples of such configurations are found in the genetic code, among these are the groups of synonymous codons, and the cluster of codons which have an hydrophobic amino acid for translation. Author

A84-40491

**COUPLED AMINO ACID VESTIGES OF THE PRIMORDIAL GENETIC CODE**

D. GRAFSTEIN (Optimer, Inc., North Branch, NJ) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 589-596. refs

It is pointed out that vestiges of the primordial genetic code may be discerned in the composition or biochemistry of all known naturally occurring binary combinations of L- with D-amino acids, in antagonisms between D-amino acids and in coupled amino acid transport through tissues. The present investigation is concerned with the probability that these and several similar correlations are fortuitous. A translation table for the primordial genetic code is considered along with the occurrence of D-amino acids in vivo, the lombricine equilibrium, D-amino acid antagonists, amino acid transport, and vicinal peptides sequences. It is found that the probability of an occurrence of the considered correlations by chance is extremely small. G.R.

A84-40492\* Alabama Univ., Birmingham.

**AMINOACYL-NUCLEOTIDE REACTIONS - STUDIES RELATED TO THE ORIGIN OF THE GENETIC CODE AND PROTEIN SYNTHESIS**

D. W. MULLINS, JR., N. SENARATNE, and J. C. LACEY, JR. (Alabama, University, Birmingham, AL) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 597-604. refs  
(Contract NGR-01-010-001)

In the present paper, a report is presented on the effect of pH and carbonate on the hydrolysis rate constants of N-blocked and free aminoacyl adenylate anhydrides. Whereas the hydrolysis of free aminoacyl adenylates seems principally catalyzed by OH(-), the hydrolysis of the N-blocked species is also catalyzed by H(+), giving this compound a U-shaped hydrolysis vs. pH curve. Furthermore, at pH's less than 8, carbonate has an extreme catalytic effect on the hydrolysis of free aminoacyl-AMP anhydride, but essentially no effect on the hydrolysis of N-blocked aminoacyl-AMP anhydride. Furthermore, the N-blocked aminoacyl-AMP anhydride is a very efficient generator of peptides using free glycine as acceptor. The possible significance of the observations to prebiological peptide synthesis is discussed. Author

A84-40493

**THE SELECTION AND COEXISTENCE OF A PLURAL NUMBER OF PRIMITIVE TRNAS AND THE ORIGIN OF THE GENETIC CODE**

M. ISHIGAMI, O. AONO, T. HAMAMOTO, M. KINJO, S. SAIGO, K. GOTO (Jichi Medical School, Minamikawachi, Tochigi, Japan), and Y. HATTORI (Kanagawa University, Yokohama, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 605-612. refs

Simulation experiments on Darwinian evolution of primitive tRNAs in coacervate droplets were carried out using four kinds of colored marbles in a computer system. Plural numbers of specified primitive tRNAs were selected and coexisted continuously under the suitable conditions. It is suggested that these conditions simulate the real process of selection and coexistence of primitive tRNAs and the origin of the genetic code. Author

A84-40495\* Cornell Univ., Ithaca, N.Y.

**NUCLEIC ACIDS, PROTEINS, AND CHIRALITY**

D. A. USHER, A. T. PROFY, S. A. WALSTRUM, M. C. NEEDELS, S. C. BULACK, and K. M. LO (Cornell University, Ithaca, NY) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 621-628. refs  
(Contract NIH-GM-26249; NAGW-493)

The present investigation is concerned with experimental results related, in one case, to the chirality of nucleotides, and, in another case, to the possibility of a link between the chirality of nucleic acids, and that of peptides. It has been found that aminoacylation of the 'internal' hydroxyl group of a dinucleoside monophosphate can occur stereoselectively. However, this reaction has not yet been made a part of a working peptide synthesis scheme. The formation and cleavage of oligonucleotides is considered. In the event of the formation of a helical complex between the oligonucleotide and the polymer, 1-prime,5-prime-bonds in the oligomer are found to become more resistant towards cleavage. The conditions required for peptide bond formation are examined, taking into account the known structures of RNA and possible mechanisms for prebiotic peptide bond formation. The possibility is considered that the 2-prime,5-prime-internucleotide linkage could have played an important part in the early days of biological peptide synthesis. G.R.

A84-40496

**ORIGIN OF THE GENETIC CODE AND SPECIFICITY OF TRNA AMINOACYLATION - A TESTABLE MODEL**

P. LESTIENNE (Ecole Polytechnique, Palaiseau, Essonne, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 629-635. refs

A84-40497

**DISSIMILAR RATES IN MOLECULAR EVOLUTION**

M. A. SOTO and J. TOHA (Universidad de Chile, Santiago, Chile) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 637-642. Research supported by the Universidad de Chile.

In this work attention is given to an evolutionary tree based on the differences in the physico-chemical properties involved in amino acid substitutions, instead of considering, for its construction, only the number of changes between species. Phylogenetic trees were constructed from the differences in bulkiness, refractivity index, hydrophobicity, polarity and optical rotation of 9 vertebrate calcitonins. A correlation of the form  $y = a(x \text{ to the } b \text{ power})$  was found between the number of changes (x) and the differences in any given physico-chemical property (y). This correlation implies

that the evolutionary time can not be evaluated directly from the number of changes between species. Author

A84-40498

**SPECULATIONS ON THE EVOLUTION OF THE GENETIC CODE. III - THE EVOLUTION OF T-RNA**

H. HARTMAN (MIT, Cambridge, MA) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 643-648. refs

It is postulated that the primitive genetic code was a doublet G, C code. The code consisted of GG coding for glycine, CC for proline, CG for arginine, and GC for alanine. The present investigation is concerned with the speculation that the remnants of this primitive code exist in the loops of the present day t-RNA. It is suggested that the code began as a doublet GC code. The codons and anticodons were CC, GG, CG, GC which were preceded by a thiouridine. The activated amino acids were thioesters associated with the thiouridine. This system was succeeded by one in which an adenosine was added to the 3-prime end giving UGGA, UCCA, UGCA, UCGA. The activated amino acids were now esters rather than thioesters. The peptides were small, about 4 or 5 amino acids in length. The codons and anticodons became five nucleotides in length U . . . A, and triplets rather than doublets coded for amino acids. Finally, the loop and arm structure evolved and polymerized into the form of t-RNA which is known today. The system in which the t-RNA evolved is postulated to be a replicating clay system. G.R.

A84-40499

**THE EVOLUTION OF DINITROGEN FIXATION**

E. BRODA and G. A. PESCHEK (Wien, Universitaet, Vienna, Austria) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 653-656. refs

It is argued that nitrogenase originated monophyletically in obligate anaerobes similar to Clostridia. The enzyme system was later inherited, without much change, by photosynthetic bacteria, by prokaryotic plants (blue-greens) and by aerobic bacteria. The hydrogenase function of the enzyme complex preceded the nitrogenase function, and was useful in hydrogen fermentations. The consumption of ATP served to assure disposal of electrons in the form of hydrogen gas. The present need of the enzyme system, whether acting as a hydrogenase or as a nitrogenase, for ATP may be a relic from the period when the biosphere was still reducing. Author

A84-40500\*

George Washington Univ. Medical Center, Washington, D.C.

**EVOLUTION OF PROKARYOTE AND EUKARYOTE LINES INFERRED FROM SEQUENCE EVIDENCE**

L. T. HUNT, D. G. GEORGE, L.-S. YEH (Georgetown University, Medical Center, Washington, DC), and M. O. DAYHOFF (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 657-664. refs  
(Contract NASW-3317; NIH-GM-08710)

This paper describes the evolution of prokaryotes and early eukaryotes, including their symbiotic relationships, as inferred from phylogenetic trees of bacterial ferredoxin, 5S ribosomal RNA, ribulose-1,5-biphosphate carboxylase large chain, and mitochondrial cytochrome oxidase polypeptide II. Author

A84-40501

**SOME BIOCHEMICAL PROPERTIES OF AN ACIDO-THERMOPHILIC ARCHAEABACTERIUM, SULFOLOBUS ACIDOCALDARIUS**

T. OSHIMA, M. OHBA, and T. WAKAGI (Mitsubishi-Kasei Institute of Life Sciences, Tokyo, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 665-669. refs

A84-40502\* Boston Univ., Mass.

**THE STRATIFIED MICROBIAL COMMUNITY AT LAGUNA FIGUEROA, BAJA CALIFORNIA, MEXICO - A POSSIBLE MODEL FOR PREPHANEROZOIC LAMINATED MICROBIAL COMMUNITIES PRESERVED IN CHERTS**

J. F. STOLZ and L. MARGULIS (Boston University, Boston, MA) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 671-679. Research supported by Boston University. refs  
(Contract NGR-22-004-025)

A84-40503

**THE LOGIC OF THE GENETIC CODE - SYNONYMS AND OPTIMALITY AGAINST EFFECTS OF MUTATIONS**

J. M. LABOUYGUES (Clermont-Ferrand Universite, Clermont-Ferrand, Puy-de-Dome, France) and A. FIGUREAU (Lyon I, Universite, Villeurbanne, Rhone, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 685-692. refs

The groups of codons which correspond to the same amino-acid in the genetic code (synonyms) are compared to theoretical codes constructed so as to resist best to the effects of mutations. The analysis shows that the genetic code presents synonymy structures which are optimized against translation errors. Author

A84-40504

**EVOLUTION OF BIOCATALYSIS. III - POST-GENETIC-CODE EVOLUTION OF CONDENSATION REACTIONS. IV - NICOTINAMIDE, FLAVIN AND DIOXYGEN DEPENDENT HYDROXYLATION - ORIGIN OF A NON-IMITABLE ENZYME**

C. M. VISSER (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 693-705. Research supported by the Hollandsche Maatschappij der Wetenschappen. refs

A84-40505

**DOMAIN STRUCTURES AND MOLECULAR EVOLUTION OF CLASS I AND CLASS II MAJOR HISTOCOMPATIBILITY GENE COMPLEX (MHC) PRODUCTS DEDUCED FROM AMINO ACID AND NUCLEOTIDE SEQUENCE HOMOLOGIES**

K. OHNISHI (Niigata University, Niigata, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 707-715. refs

A84-40506

**TOWARDS A CLASSIFICATION OF E. COLI RIBOSOMAL PROTEINS - A HYPOTHETICAL 'SMALL RIBOSOME' AS A PRIMITIVE PROTEIN-SYNTHESIZING APPARATUS**

K. OHNISHI (Niigata University, Niigata, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 717-724. refs

A84-40507

**TRANSMEMBRANE ELECTRON TRANSPORT AND THE NEUTRAL THEORY OF EVOLUTION**

S. SCHERER (Konstanz, Universitaet, Constance, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 725-731.

Based on the concept of 'pairs of basic functional states' the evolution of the first chemiosmotic mechanism of energy conversion is discussed in terms of point mutations, gene duplications and of the neutral theory of evolution. A model for estimating the overall probability of the evolutionary step in question is presented, both for the 'selectionist' and 'neutralist' position. It is concluded that, concerning the present stage of knowledge, the evolution of transmembrane electron transport is an unsolved problem in evolutionary biology. Author

A84-40508\* Maryland Univ., College Park.

**ON ARCHAEABACTERIAL ATPASE FROM HALOBACTERIUM SACCHAROVORUM**

H. KRISTJANSSON, C. PONNAMPERUMA (Maryland, University, College Park, MD), L. HOCHSTEIN (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA), and W. ALTEKAR (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 733-738.

The energy transducing ATPase from Halobacterium saccharovorum was studied in order to define the origin of energy transducing systems. The ATPase required high salt concentration (4M NaCl) for activity; activity was rapidly lost when NaCl was below 1 Molar. At low salt concentration, the membrane bound ATPase activity could be stabilized in presence of spermine. However, following solubilization spermine was ineffective. Furthermore, F1 ATPase activity was stabilized by ammonium sulfate even when the NaCl concentration was less than 1 Molar. These studies suggest that stabilization by hydrophobic interactions preceded ionic ones in the evolution of the energy transducing ATPases. Author

A84-40509

**A RELATIONSHIP BETWEEN PROKARYOTE AND EUKARYOTE OBSERVED IN NITROBACTER AGILIS CYTOCHROMES AA3 AND C**

T. YAMANAKA, Y. FUKUMORI (Tokyo Institute of Technology, Tokyo, Japan), and Y. TANAKA (Osaka University, Toyonaka, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 739-746. refs

A84-40510

**THE MATHEMATICAL LOGIC OF LIFE**

G. CULLMANN and J. M. LABOUYGUES (Clermont-Ferrand, Universite, Clermont-Ferrand, Puy-de-Dome, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 747-755. refs

Protein synthesis can be likened to a particular coded information storage, transmission and execution system. Noise, error or mutations are the essential phenomena to which a living organism is subjected. Genetic coding aims at preserving the integrity of a structure under aggression from the surroundings. It can be shown that the different amino acids translated in the proteins, except the particular case of SER, obey a logical code for optimization of resistance to mutation effects. The study of the structure of this code allows a better comprehension of the logic of life. Author

A84-40511\* Hawaii Univ., Manoa.

**BRINE ORGANISMS AND THE QUESTION OF HABITAT-SPECIFIC ADAPTATION**

B. Z. SIEGEL, S. M. SIEGEL, T. SPEITEL (Hawaii, University, Honolulu, HI), J. WABER (West Chester State College, West Chester, PA), and R. STOECKER (Energy and Environmental Analysts, Inc., Garden City, NY) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 757-770. refs

(Contract NASW-767; NGL-12-001-042; NSF DPP-77-21507)

The question of adaptivity to extremely saline water environments is discussed, with attention given to the evolutionary performance of four common organisms including *Cladonia skottsbergii*, *Penicillium notatum*, *Nostoc*, and *Dunaliella salina*. Samples of each organism were collected and subjected to experimental conditions similar to extreme marine and limnetic environments in the Dead Sea and Don Juan Pond in the upper Wright valley of Antarctica. Measurements were made of isotope uptake and carbon dioxide production, and photoautotrophs were taken. It is found that all of the organisms responded quickly to the need to adapt to the extreme environments. It is concluded that a degree of uncertainty exists in the perception that the abundance of bulk water on the earth is in itself essential for life.

I.H.

A84-40513

**FUTURE ESA MISSIONS IN BIOLOGY**

S. L. BONTING (ESA, Paris, France; Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 777-783. refs

A survey is given of the life sciences research program sponsored by the European Space Agency (ESA). This program rests on a number of facilities originated by ESA: Spacelab, Space sled, Biorack, Anthrorack, Eureka and its Botany and Protein Crystallization facilities. They are all to be brought into space and returned by one of the NASA Space Shuttles. With these facilities a wide range of space biology research will be covered: cell biology, developmental biology, botany, human physiology, radio-biology, exobiology and biotechnology. Information is given on how to prepare, submit and execute an experiment proposal. Author

A84-40514

**EUROPEAN RETRIEVABLE CARRIER EURECA**

G. SEIBERT (ESA, Paris, France) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 785-792.

The European Retrievable Carrier (EURECA), which is scheduled to be launched from the Shuttle in 1987, is an ESA reusable free-flying platform with an operational orbit of approximately 500 km. The first mission, consisting of life and material sciences research, is planned to last about 6 months. The experimental hardware should allow the processing of metallurgical samples and biochemical investigations. Because of reduced gravitational forces, material science experiments would have a number of specific advantages, such as reduced gravity-driven convection, negligible sedimentation, and possible containerless handling of liquids. Studies in protein crystallization and botany could also benefit from the reduced gravity environment. The mission also offers opportunity for long exposure of terrestrial origin materials to environments of space such as radiation, vacuum, temperature extremes and microgravity. Three aspects in the area of exobiology, whose study in space is promising, are prebiotic evolution, search for extraterrestrial life, and interplanetary transfer of biological matter. J.P.

A84-40515\* National Aeronautics and Space Administration, Washington, D. C.

**NASA'S EXOBIOLGY PROGRAM**

D. L. DEVINCENZI (NASA, Washington, DC) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 793-799.

The goal of NASA's Exobiology Program is to understand the origin, evolution, and distribution of life, and life-related molecules, on earth and throughout the universe. Emphasis is focused on determining how the rate and direction of these processes were affected by the chemical and physical environment of the evolving planet, as well as by planetary, solar, and astrophysical phenomena. This is accomplished by a multi-disciplinary program of research conducted by over 60 principal investigators in both NASA and university laboratories. Major program thrusts are in the following research areas: biogenic elements; chemical evolution; origin of life; organic geochemistry; evolution of higher life forms; solar system exploration; and the search for extraterrestrial intelligence (SETI). Author

A84-40517

**ANAEROBIC LIFE AT EXTREMELY HIGH TEMPERATURES**

K. O. STETTER (Regensburg, Universitaet, Regensburg, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 809-815. refs

Continental and submarine sulfataric fields turned out to contain various extremely thermophilic anaerobic organisms which all belong to the archaeobacteria. They are living autotrophically on sulphur, hydrogen, and CO<sub>2</sub> or by methanogenesis or heterotrophically on different organic substrates by sulphur respiration or, less frequently, by fermentation. The most extremely thermophilic isolates are growing between 80 and 110 C with an optimum around 105 C. Author

A84-40519

**SURVIVAL OF FROG STRIATED MUSCLE AFTER PRESSURE COOLING**

R. VON BAUMGARTEN, R. FASSBENDER (Mainz, Universitaet, Mainz, West Germany), and E. MARTIN (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 833-840.

Electromicroscopical studies and tests of isometric contractility were performed on striated frog bicep muscle after treatment with elevated hydrostatic pressure at room temperature and at various temperatures below 0 C. At pressure of 700 bar for 15 minutes at room temperature, rigor was observed as well as damage to the sarcomers and mitochondria. At pressure of 500 bar for the same amount of time at -17 C solid freezing was noted and was connected with severe damage to the muscular tissue and the loss of all function. Pressure of 518 bar and cooling to -7 C allowed good preservation of the muscular ultrastructure and greater survival of the tissue. It is suggested that ATP depletion contributes to the irreversible rigor following long and strong compression without cooling. Some methods for reducing the damage of cooling and pressure on muscle tissue are described. I.H.

A84-40629

**CANCER OBSERVATION IN ZERO G - GETAWAY SPECIAL PROGRAM**

A. M. BRYLANSKI IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IIB-8, IIB-9.

This is a proposal for an experiment observing cancer cell activity when exposed to zero gravity. A step by step outline of the process of the experiment is included. Diagrams of basic

construction of the experiment and the equipment illustrate the process. Explanations of pre-experiments and parallel experiments are discussed. Types of cells, wash solvents, and culture material are given in the discussion. Author

**A84-40630**

**THE EFFECTS OF A ZERO-GRAVITY ENVIRONMENT ON THE CROSSING OVER MECHANISM OF YEAST CHROMOSOMES - RECOMBINATION IN OUTER SPACE (GETAWAY SPECIAL PROGRAM)**

A. L. RHODES IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IIB-10 to IIB-13.

A Getaway Special experiment to observe the effects of microgravity on allele recombination in yeast cells (*Saccharomyces cerevisiae*) is proposed. The advantages of using yeast cells in an automated space experiment are explained, and the possible microgravity effects are discussed. The chromosomal-recombination (crossover) frequency can be determined by the use of a cross with a nutritionally mutant strain and tetrad analysis, measuring the nutritional characteristics of the offspring colonies. The equipment needed for the experiment and the procedures to be followed are considered. T.K.

**A84-40631**

**PLANARIA REGENERATION IN ZERO GRAVITY (GETAWAY SPECIAL PROGRAM)**

D. K. RASHKOVER (Pioneer Middle School, Cooper City, FL) IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IIB-14 to IIB-16.

A report is presented on an experimental package designed for the Getaway Special Program. The experiment is concerned with a comparison regarding the regeneration of body parts on cut *Planaria* worms, taking into account a group of worms in space and another group on earth. It is hoped that this experiment will provide information regarding the effects of zero gravity on regeneration of tissue. Basically, the experiment involves cutting *Planaria* into head and tail sections and allowing them to regenerate. One group of worms is to be taken on board the Shuttle to expose them to zero gravity conditions, while the second group would be kept on earth. Details regarding the experiment are discussed, taking into account also a number of difficulties. G.R.

**A84-40695**

**CHANGES IN THE CONTENT OF BOUND CALCIUM IN THE CEREBRAL CORTEX AFTER THE CESSATION OF OXYGEN SUPPLY [DINAMIKA SODERZHANIYA SVIAZANNOGO KAL'TSIYA V KORE GOLOVNOGO MOZGA POSLE PREKRASHCHENIYA SNABZHENIYA KISLORODOM]**

M. O. SAMOILOV, D. G. SEMENOV, and V. N. MAIOROV (Akademiya Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 70, May 1984, p. 601-608. In Russian. refs

The chlorotetracycline fluorescent probe technique was used for an in situ investigation of changes in the content of calcium bound with membranes in the cat cortex during five-minute anoxia. A rapid progressive decrease in the content of the bound calcium was noted during the anoxia. Attention is given to the role of early disturbances of intracellular calcium metabolism in mechanisms for the initiation of nerve-cell responses to hypoxia. B.J.

**A84-40696**

**THE RESISTIVE, CAPACITIVE, AND METABOLIC FUNCTION OF THE SMALL-INTESTINE VESSELS IN ACUTE HYPOXIC HYPOXIA [REZISTIVNAYA, EMKOSTNAYA I OBMENNAYA FUNKTSIYA SOSUDOV TONKOGO KISHECHNIKA PRI OSTROI GIPOKSICHESKOI GIPOKSII]**

B. I. TKACHENKO and I. I. IBRAGIMOV (Akademiya Meditsinskikh Nauk SSSR, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 70, May 1984, p. 659-666. In Russian. refs

Acute experiments were performed on cats under conditions of autoperfusion of the small-intestine vessels. Acute hypoxic hypoxia was found to produce a short-term increase of precapillary resistance, a stable decrease of postcapillary resistance, a decrease of capillary hydrostatic pressure, and absorption of fluid from the interstitial space into the blood with an increase of the exchange surface. Attention is given to the mechanisms responsible for these vascular and filtration-absorbent changes in the intestine during hypoxia. B.J.

**A84-40697**

**ROLE OF THE SYMPATHETIC NERVOUS SYSTEM IN ADAPTIVE CHANGES OF THE ENERGY METABOLISM OF THE BRAIN DURING ISCHEMIA AND IN THE POST ISCHEMIC PERIOD [ROL' SIMPATICHESKOI NERVNOI SISTEMY V ADAPTIVNYKH IZMENENIYAKH ENERGETICHESKOGO METABOLIZMA MOZGA PRI EGO ISHEMII I POSTISHEMICHESKOM PERIODE]**

S. I. TEPULOV (Akademiya Nauk SSSR, Institut Fiziologii, Leningrad, USSR) and L. V. GOVOROVA (Ministerstvo Zdravookhraneniya RSFSR, Nauchno-Issledovatel'skii Institut Detskikh Infektsii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 70, May 1984, p. 692-700. In Russian. refs

**A84-40698**

**BLOOD-FLOW DISTRIBUTION IN THE BRAIN, KIDNEY, INTESTINE, SPLEEN AND HIND LIMBS OF CATS UNDER ACUTE HYPOXIA [RASPREDELENIE KROVOTOKA V MOZG, POCHKU, KISHECHNIK, SELEZENKU I ZADNIE KONECHNOSTI U KOSHEK PRI OSTROI GIPOKSII]**

B. B. IRIPKhanov, A. I. KRIVCHENKO, and I. E. MOSKALENKO (Akademiya Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 70, May 1984, p. 729-731. In Russian. refs

Experiments performed on cats indicate that a particular type of adaptive reaction occurs in the cardiovascular system during acute hypoxia. This type of reaction is directed toward compensation of oxygen deficiency, primarily in the most vital organs. This occurs as a consequence of differences in the sensitivities of vessels of different organs to arterial PO<sub>2</sub>, which makes possible the redistribution of blood during acute hypoxia. B.J.

**A84-40710**

**COMBINED EFFECT OF PHENOL AND ELEVATED AIR TEMPERATURE ON THE ORGANISM [SOCHETANNOE DEISTVIE FENOLA I POVYSHENNOI TEMPERATURY VOZDUKHA NA ORGANIZM]**

L. M. MELESOVA, V. K. FADEEVA, and E. M. VIKHROVA (Akademiya Meditsinskikh Nauk SSSR, Moscow, USSR) Gigiena i Sanitariya (ISSN 0016-9900), Jan. 1984, p. 22-25. In Russian. refs

Features characterizing thermoregulatory responses were investigated in rats. Attention was given to the relationship between these responses and nonspecific physiological shifts (the leukocyte pattern and carbohydrate-metabolism indicators) in different periods of adaptation to the combined effect of high temperature and phenol. It is established that phenol has a detrimental effect on adaptation to high temperature. B.J.



A84-40713

**MORPHOPHYSIOLOGICAL RELATIONSHIPS REVEALED BY THE MATHEMATICAL MODELING OF REACTIVE CHANGES OF NEURONS [MORFOFIZIOLOGICHESKIE SOOTNOSHENIIA VYIAVLENNYE V POMOSHCH'U MATEMATICHESKOGO MODELIROVANIYA REAKTIVNYKH IZMENENII NEIRONA]**

O. S. SOTNIKOV, A. I. PANIN, and V. P. PRAZDNIKOVA (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Arkhiv Anatomii, Gistologii i Embriologii (ISSN 0004-1947), vol. 86, Jan. 1984, p. 9-27. In Russian. refs

A84-40715

**THE PARADOX OF IMMUNITY - THE 'FOREIGN' IN 'ONE'S OWN' [PARADOKS IMMUNITETA - 'CHUZHOE' V 'SVOEM']**

A. S. SHEVELEV (Smolenskii Meditsinskii Institut, Smolensk, USSR) Priroda (ISSN 0032-874X), Jan. 1984, p. 30-37. In Russian. refs

The hypothesis of immunological surveillance is briefly examined, and several exceptions to the surveillance 'rule' are considered. The features of 'beyond-the-barrier' immunology are then examined in detail, and attention is given to surveillance in 'beyond-the-barrier' organs and to experimental-verification procedures with regard to such surveillance. B.J.

A84-40719

**AGE-RELATED CHANGES OF THE MYOCARDIAL CONTRACTILE FUNCTION AND THE DEPENDENCE OF THESE CHANGES ON CARDIOMYOCYTE SIZE [VOZRASTNAIA DINAMIKA SOKRATITEL'NOI FUNKTSII MIOKARDA I EE ZAVISIMOST' OT RAZMERA KARDIOMIOTSITOV]**

F. Z. MEERSON and A. I. SAULIA (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Kardiologiya (ISSN 0022-9040), vol. 24, Jan. 1984, p. 71-76. In Russian. refs

An experimental study performed on rats demonstrates that the age-related reduction in the myocardial contractile function is correlated with an increase in the volume of cardiomyocytes constituting the muscle and a reduction in the specific area under the sarcolemma of these cells. The functional depression and the cardiac response to changed calcium concentration in the bath medium increased with age, while the positive inotropic effect of HF stimulation and adrenoactivity was enhanced. The enhancement of these effects may be associated with the fact that the capacity of sarcolemma systems responsible for calcium withdrawal from the cells grows weaker with age. B.J.

A84-40720

**RELATIONSHIP BETWEEN BLOOD SUPPLY AND ENERGY METABOLISM OF THE MYOCARDIUM [VZAIMOSVIAZ' MEZHDU KROVOSNABZHENIEM I ENERGETICHESKIM OBMENOM MIOKARDA]**

R. A. FROLKIS (Ukrainskii Nauchno-Issledovatel'skii Institut Kardiologii, Kiev, Ukrainian SSR) Kardiologiya (ISSN 0022-9040), vol. 24, Jan. 1984, p. 76-80. In Russian. refs

**A84-40817\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**THE EFFECT OF OXYGEN ON DENITRIFICATION DURING STEADY-STATE GROWTH OF PARACOCCLUS HALODENITRIFICANS**

L. I. HOCHSTEIN, M. BETLACH, and G. KRITIKOS (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA) Archives of Microbiology (ISSN 0302-8933), vol. 137, 1984, p. 74-78. refs

Steady-state cultures of *Paracoccus halodenitrificans* were grown anaerobically prior to establishing steady states at different concentrations of oxygen. In the absence of oxygen, nitrate-limited cultures produced dinitrogen, and as the oxygen supply increased, these cultures produced nitrous oxide, then nitrite. These changes reflected two phenomena: the inactivation of nitrous oxide reductase by oxygen and the diversion of electrons from nitrite to oxygen. Author

**A84-40818\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**A DISSIMILATORY NITRITE REDUCTASE IN PARACOCCLUS HALODENITRIFICANS**

M. A. GRANT and L. I. HOCHSTEIN (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA) Archives of Microbiology (ISSN 0302-8933), vol. 137, 1984, p. 79-84. refs

*Paracoccus halodenitrificans* produced a membrane-associated nitrite reductase. Spectrophotometric analysis showed it to be associated with a cd-cytochrome and located on the inner side of the cytoplasmic membrane. When supplied with nitrite, membrane preparations produced nitrous oxide and nitric oxide in different ratios depending on the electron donor employed. The nitrite reductase was maximally active at relatively low concentrations of sodium chloride and remained attached to the membranes at 100 mM sodium chloride. Author

A84-40825\*

**EVOLUTIONARY CONNECTIONS OF BIOLOGICAL KINGDOMS BASED ON PROTEIN AND NUCLEIC ACID SEQUENCE EVIDENCE**

M. O. DAYHOFF Precambrian Research (ISSN 0301-9268), vol. 20, 1983, p. 299-318. refs  
(Contract NASW-3317; NIH-GM-08710)

Prokaryotic and eukaryotic evolutionary trees are developed from protein and nucleic-acid sequences by the methods of numerical taxonomy. Trees are presented for bacterial ferredoxins, 5S ribosomal RNA, c-type cytochromes, cytochromes c2 and c', and 5.8S ribosomal RNA; the implications for early evolution are discussed; and a composite tree showing the branching of the anaerobes, aerobes, archaeobacteria, and eukaryotes is shown. Single lines are found for all oxygen-evolving photosynthetic forms and for the salt-loving and high-temperature forms of archaeobacteria. It is argued that the eukaryote mitochondria, chloroplasts, and cytoplasmic host material are descended from free-living prokaryotes that formed symbiotic associations, with more than one symbiotic event involved in the evolution of each organelle. T.K.

**A84-40995\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**ENKEPHALIN INHIBITION OF ANGIOTENSIN-STIMULATED RELEASE OF OXYTOCIN AND VASOPRESSIN**

L. C. KEIL, O. CHEE (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA), L. M. ROSELLA-DAMPAN, S. EMMERT, and J. Y. SUMMY-LONG (Pennsylvania State University, Hershey, PA) Brain Research (ISSN 0006-8993), no. 297, 1984, p. 329-336. refs

(Contract NIH-HL-25726; NIH-HL-26039)

The effect of intracerebroventricular (ICV) pretreatment with 100 ng/5 microliter leucine(5)-enkephalin (LE) on the increase in plasma oxytocin (OT) and vasopressin (VP) caused by ICV injection of 10, 50, or 100 ng/5 microliter of angiotensin II (All) is investigated experimentally in conscious adult male Sprague-Dawley rats; the effects of water-deprivation dehydration and lactation/suckling (in female rats) are also studied. An OT radioimmunoassay (RIA) with a sensitivity of 800 fg/ml (described in detail) and the VP RIA technique of Keil and Severs (1977) are employed. Administration of All or dehydration for 48 or 72 h cause a significant increase in OT and VP without affecting the ratio, while lactation and suckling increase OT only. LE pretreatment inhibits significantly but does not suppress the All-stimulated OT-VP response. T.K.

**A84-40998\*** National Biomedical Research Foundation, Washington, D. C.

**SEQUENCE EVIDENCE FOR THE SYMBIOTIC ORIGINS OF CHLOROPLASTS AND MITOCHONDRIA**

D. G. GEORGE, L. T. HUNT, and M. O. DAYHOFF (National Biomedical Research Foundation, Georgetown University Medical Center, Washington, DC) IN: *Endocytobiology*. Volume 2. Berlin, Walter de Gruyter und Co., p. 845-861. refs (Contract NASW-3317; NIH-GM-08710)

The origin of mitochondria and chloroplasts is investigated on the basis of prokaryotic and early-eukaryotic evolutionary trees derived from protein and nucleic-acid sequences by the method of Dayhoff (1979). Trees for bacterial ferredoxins, 5S ribosomal RNA, c-type cytochromes, the lipid-binding subunit of ATPase, and dihydrofolate reductase are presented and discussed. Good agreement among the trees is found, and it is argued that the mitochondria and chloroplasts evolved by multiple symbiotic events. T.K.

**A84-41041\***  
**ESTABLISHING HOMOLOGIES IN PROTEIN SEQUENCES**

M. O. DAYHOFF, W. C. BARKER, and L. T. HUNT IN: *Enzyme structure*. Part 1. New York, Academic Press, 1983, p. 524-545. refs

(Contract NIH-GM-08710; NASW-3317)

Computer-based statistical techniques used to determine homologies between proteins occurring in different species are reviewed. The technique is based on comparison of two protein sequences, either by relating all segments of a given length in one sequence to all segments of the second or by finding the best alignment of the two sequences. Approaches discussed include selection using printed tabulations, identification of very similar sequences, and computer searches of a database. The use of the SEARCH, RELATE, and ALIGN programs (Dayhoff, 1979) is explained; sample data are presented in graphs, diagrams, and tables and the construction of scoring matrices is considered. T.K.

**A84-41049**

**THE CELL IN THE FIELD OF GRAVITY AND THE CENTRIFUGAL FIELD**

P. E. MOROZ *Journal of Theoretical Biology* (ISSN 0022-5193), vol. 107, 1984, p. 303-320. refs

The present investigation is concerned with questions regarding a possible relationship between centrifugal forces required for intracellular stratification, the earth's gravity, and the spectrum of living cell sizes. Attention is given to intracellular settling in the gravitational field, general centrifugal cell stratification, centrifugal stratification as a function of cell size, protection from gravity in giant cells, and mitosis as a possible response of the cell to the force of gravity. A description is given of several possible experimental approaches to the determination of the relationship between cell size and the G-force necessary for a given degree of intracellular stratification per unit of time. The various sizes of living cells, i.e., their size limits, are considered as possible adaptations to the force of the earth's gravity. Increased viscosity of the cell reduces the trend to sedimentation and allows cells of greater size to survive. G.R.

**A84-41172**

**THE DYNAMICS OF OXYGEN TRANSPORT IN ERYTHROCYTES [DINAMIKA TRANSPORTA KISLORODA V ERITROTSITE]**

IU. I. LUCHAKOV and IU. IA. KISLIAKOV (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Biofizika* (ISSN 0006-3029), vol. 29, May-June 1984, p. 442-446. In Russian. refs

A mathematical model is used to describe the dynamics of oxygen transport in erythrocytes. The model takes into account erythrocyte shape, the diffusion resistance of hemoglobin solution, the dissociative pattern of oxyhemoglobin, and the dynamics of the distribution of oxygen tension throughout the erythrocyte. The model is described in terms of a system of partial differential equations, and a solution is derived on a computer using a net method. Abrupt jumps of pO<sub>2</sub> concentrations inside the erythrocyte

were found during rapid movement in the media with different partial pressure of O<sub>2</sub>. A quantitative relationship was found between the rate of physicochemical reactions of oxygen binding and yield by hemoglobin and the level of hemoglobin saturation with oxygen in erythrocytes. I.H.

**A84-41173**

**MITOCHONDRIAL CARRIER OF ADENYLATE EXECUTES THE REGULATION OF ATP PRODUCTION IN THE PHYSIOLOGICAL RANGE OF RESPIRATION RATES [MITOKHONDRIAL'NYI PERENOSCHIK ADENILATOV OSUSHCHESTVIAET REGULIATSIIU PROIZVODSTVA ATF V FIZIOLOGICHESKOM DIAPAZONE SKOROSTEI DYKHANIIA]**

B. N. KHOLODENKO (Nauchno-Issledovatel'skii Institut po Biologicheskim Ispytaniiam Khimicheskikh Soedinenii, Kupavna, USSR) *Biofizika* (ISSN 0006-3029), vol. 29, May-June 1984, p. 453-458. In Russian. refs

**A84-41174**

**THE EFFECT OF CONTINUOUS MILLIMETER RADIATION OF LOW INTENSITY ON NA(+) ION TRANSPORT IN FROG SKIN [VLIANIE NEPRERYVNOGO MILLIMETROVOGO IZLUCHENIIA NIZKOI INTENSIVNOSTI NA TRANSPORT IONOV NA(+) V KOZHE LIAGUSHKI]**

K. D. KAZARINOV, V. S. SHAROV, A. V. PUTVINSKII, and O. V. BETSKII (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR) *Biofizika* (ISSN 0006-3029), vol. 29, May-June 1984, p. 480-482. In Russian.

**A84-41226**

**THE EFFECTS OF PROLONGED PHYSICAL EXERCISE AND HYPERBARIC HYPOXIA ON MYOCARDIAL GLYCOGEN [ROLE DE L'EXERCICE PHYSIQUE PROLONGEET DE L'HYPOXE HYPOBARE, SUR LE GLYCOGENE MYOCARDIQUE]**

C. Y. GUEZENNEC, B. SERRURIER, M. AYMONOD, D. MERINO, and P. PESQUIES (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Laboratoire Central de Biologie Aerospatiale, Paris, France) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 104-106. In French.

The rate of evolution of myocardial glycogen was examined in rats running treadmill exercises at simulated sea level and 3-5 km altitudes. Exercise and rest trials lasted 1, 3 or 5 hr at each altitude. After each trial the subjects' cervical vertebrae were broken, the hearts were extracted and frozen in liquid N<sub>2</sub>. Measurements were then made of the heart tissue glycogen content (GC). No significant difference was exhibited in the GC of running and resting rats at sea level. The glycogen level increased in running rats at 3000 m and decreased dramatically in running rats at 5000 m altitude. It is concluded that a threshold exists, for rats, between 3-5 km altitude, where anaerobic glycolysis from heart muscle glycogen reserves plays a critical role in myocardial functions. M.S.K.

**A84-41234**

**PROBLEMS POSED BY THE AERONAUTICAL USAGE OF HALOCARBON EXTINGUISHER AGENTS [PROBLEMES POSES PAR L'UTILISATION EN AERONAUTIQUE DES AGENTS EXTINCTEURS HALOCARBONES]**

H. VIEILLEFOND, T. LUZY, and H. CORBE (Centre d'Essais en Vol, Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge, Essonne, France) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 174-177. In French. refs

Although halocarbon-based commercial aircraft cabin fire extinguisher systems meet criteria of efficiency and small storage volume, their pyrolytic decomposition releases toxic and corrosive fumes. Flugex 12 B 1, i.e., bromochlorodifluoromethane, has been tested on rats in simulations of 2500 m altitude. Toxicity was calculated on the basis of lethality to 50 percent of the exposed population. Although toxic doses produced death from pulmonary edema and lesions, a cabin atmospheric concentration of 4-5 percent is expected to be tolerable by humans for 30 sec. Further tests demonstrated that a sweeping spray of the Flugex will minimize toxicity. M.S.K.

## 51 LIFE SCIENCES (GENERAL)

**A84-41235**

**LESIONAL EFFECTS OF THE THERMAL DEGRADATION OF A CHLORINATED POLYMER [EFFETS LESIONNELS DES PRODUITS DE DEGRADATION THERMIQUE D'UN POLYMERE CHLORE]**

C. NOGUES, CH. FOUET, M. J. ARMAND, and P. PICART  
Medecine Aeronautique et Spatiale, vol. 23, 2nd Quarter, 1984, p. 177-182. In French. Sponsorship: Direction des Recherches, Etudes et Techniques. refs  
(Contract DRET-80-1037)

Rabbits and rats were exposed to controlled releases of combustion products of polyvinyl chloride (PVC) specimens to examine the physiological effects. Temperature levels of 400, 500 and 850 C were tested and yielded gaseous HCl concentrations of 2000-18,000 ppm. Partial pressures of O<sub>2</sub> and CO<sub>2</sub>, blood pressure and ECG monitoring was performed during the trials. The animals underwent exposure in various venting configurations. Lung specimens of sacrificed rabbits were examined with optical and electron microscopes. Capillary lesions occurred in all the animals but were more focused in the rat, which received some protection from the nasal cavities. Cellular lesions formed for the most part in the nasal epithelium and tracheal-bronchial areas. Heightened levels of hydrolytic enzymes appeared in the bronchial epithelium. Some hyperplastic tissue regeneration occurred in surviving rats. The presence of CO products aggravated the respiratory anoxic conditions. M.S.K.

**A84-41236**

**TOXICOLOGICAL STUDY OF THE THERMAL DECOMPOSITION PRODUCTS OF THREE MATERIALS - THE EFFECT OF TEMPERATURE [ETUDE TOXICOLOGIQUE DES PRODUITS DE DECOMPOSITION THERMIQUE DE TROIS MATERIAUX - INFLUENCE DE LA TEMPERATURE]**

P. PICART, M. GUERBET, J. M. JOUANY, J. P. DELCROIX, and J. M. PRESLES  
Medecine Aeronautique et Spatiale, vol. 23, 2nd Quarter, 1984, p. 183-187. In French.

The results of controlled atmosphere trials involving the exposure of test animals to combustion products expected in an aircraft cabin fire are reported. The molecular composition of the gas entering the chamber was monitored. Test animals were given curare and tracheotomized, and data were taken of the heart rate, blood pressure and ECG traces. Trials were run with burning wood, polyvinyl chloride (PVC) and polyurethane foam at various temperatures and atmospheric concentrations of combustion products, which included CO<sub>2</sub>, CO, NO(x), HCl and prussic acid. CO was found to play a major role in the toxicity of the smoke, as did prussic and HCl acids. Increases in the temperature did not increase toxicity once the toxic substance threshold temperature was reached. M.S.K.

**A84-41281**

**CHANGE IN THE MECHANICAL NOISE OF THE MYOCARDIUM PRIOR TO SPONTANEOUS EXCITATION [IZMENENIE MEKHANICHESKOGO SHUMA MYSHTSY SERDTSYA PERED SPONTANNYM VOZBUZHDENIEM]**

K. IU. BOGDANOV, S. I. ZAKHAROV, and L. V. ROZENSHTRAUKH  
(Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 276, no. 4, 1984, p. 996-999. In Russian. refs

**A84-41391**

**EFFECT OF A MODULATED UHF FIELD ON THE BEHAVIOR AND LEVEL OF HORMONES IN FEMALE RATS UNDER EMOTIONAL STRESS [VLIANIE MODULIROVANNOGO POLIA UVCH NA POVEDENIE I UROVEN' GORMONOV U SAMOK KRYSA V USLOVIIAKH EMOTSIONAL'NOGO STRESSA]**

M. M. RASULOV (Nauchno-Issledovatel'skii Institut po Biologicheskim Ispytaniim Khimicheskikh Soedinenii, Moscow, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 13-16. In Russian. refs

**A84-41392**

**PHASE CHANGES IN THE LEVEL OF GLUCOCORTICOID RECEPTORS OF RAT LIVER CYTOSOL UNDER STRESS [FAZOVYE IZMENENIIA UROVNIA GLIUKOKORTIKOIDNYKH RETSEPTOROV TSITOZOLIA PECHENI KRYSA PRI STRESSE]**

A. I. BOBKOV, N. F. MURATOV, V. V. SEMENOVA, A. S. BOBKOVA, V. A. VINOGRADOV, and V. M. POLONSKII  
(Ministerstvo Zdravookhraneniia SSSR, Moscow, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 20-24. In Russian. refs

**A84-41393**

**CONTENT OF HIGH-ENERGY PHOSPHATES AND END PRODUCTS OF GLYCOLYSIS IN THE MYOCARDIUM IN EXPERIMENTAL TRAUMATIC SHOCK [SODERZHANIE MAKROERGICHESKIKH FOSFORNYKH SOEDINENII I KONECHNYKH PRODUKTOV GLIKOLIZA V MIOKARDE PRI EKSPERIMENTAL'NOM TRAVMATICHESKOM SHOKE]**

T. V. KAZUEVA, E. E. KOVRIZHNYKH, R. I. KUZMINA, and S. A. SELEZNEV (Nauchno-Issledovatel'skii Institut Skoroi Pomoshchi, Leningrad, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 24-27. In Russian. refs

**A84-41394**

**MAIN TRENDS IN THE STUDY OF SUBSTANCE P (REVIEW) [OSNOVNYE NAPRAVLENIIA ISSLEDOVANIIA VESHCHESTVA P /OBZOR/]**

P. OEHME (Deutsche Akademie der Wissenschaften, Berlin, East Germany) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 57-59. In Russian. refs

Recent literature on substance P (Arg-Pro-Lys-Pro-Gln Gln-Phe-Phe-Gly-leu-Met-NH<sub>2</sub>) is briefly reviewed. Three aspects of the study of this substance are examined: (1) the interrelationship between stress, substance P, and catecholamines; (2) the modulatory character of the effect of substance P on the pain threshold; and (3) the main trends in the study of substance P.

B.J.

**A84-41395**

**MONOAMINERGIC MECHANISMS OF THE REGULATING EFFECT OF A NUMBER OF SHORT PEPTIDES DURING THE SIMULATION OF BEHAVIORAL PATHOLOGY [MONOAMINERGICHESKIE MEKHANIZMY REGULIRUIUSHCHEGO VLIANIIA RIADA KOROTKIKH PEPTIDOV PRI MODELIROVANIИ PATOLOGII POVEDENIIA]**

A. V. VALDMAN and M. M. KOZLOVSKAIA (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 60-67. In Russian. refs

Experimental data on intact animals (cats, rats, and mice) are analyzed, and consideration is given to models taking into account emotional stress, sleeplike states, and behavioral depression. Low-molecular peptides (MAP, MIP, and TAP) were found to have an emototropic and psychoregulating effect. The specific features of the psychotropic activity spectrum of each substance studied are analyzed. The optimizing effect of the peptides on behavior (the successful execution of a prescribed activity) is found to be closely related to the initial level of the emotional reaction. B.J.

**A84-41396**

**SUBSTANCE P - STRUCTURE AND EFFECT [VESHCHESTVO P - STRUKTURA I DEISTVIE]**

M. BIENERT (Deutsche Akademie der Wissenschaften, Berlin, East Germany) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 71-73. In Russian. refs

The relationship between the structure and effect of substance P is investigated. Attention is given to the synthesis and modification of polypeptide P and its analogues, as well as to their physicochemical properties. The synthesis of analogues with a selective effect on the central nervous system is examined. B.J.

A84-41397

**SUBSTANCE P AS A REGULATOR OF DISTURBED FUNCTIONS IN PRIMATES - EFFECT ON CONDITIONED-REFLEX ACTIVITY AND ARTERIAL-PRESSURE DYNAMICS [VESHCHESTVO P V KACHESTVE REGULIATORA NARUSHENNYKH FUNKTSII U PRIMATOV - VLIANIE NA USLOVNOREFLEKTORNUIU DEIATEL'NOST' I DINAMIKU ARTERIAL'NOGO DAVLENIIA]**

G. STEKHMESSE, P. OEHME (Deutsche Akademie der Wissenschaften, Berlin, East Germany), V. G. STARTSEV, and S. NICHKOV (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 73-75. In Russian.

A84-41398

**SUBSTANCE P IN BLOOD PLASMA AND ADRENALS OF SPONTANEOUSLY HYPERTENSIVE AND NORMOTENSIVE RATS [VESHCHESTVO P V PLAZME KROVI I NADPOCHECHNIKAKH SPONTANNO GIPERTENZIVNYKH I NORMOTENZIVNYKH KRYIS]**

R. RATHSACK, I. ROSKE, P. OEHME, and H. HILSE (Deutsche Akademie der Wissenschaften, Berlin, East Germany) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 77-79. In Russian. refs

A84-41399

**EFFECT OF PEPTIDES DURING HEMORRHAGIC SHOCK [DEISTVIE PEPTIDOV PRI GEMORRAGICHESKOM SHOKE]**  
V. KRAUSE, K. NIBER, F. EHRLICH, M. BIENERT, and P. OEHME (Deutsche Akademie der Wissenschaften, Berlin, East Germany) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 85-87. In Russian. refs

Experiments were performed on rats to determine whether MIP tripeptide has the same sort of effect on hemorrhagic shock (HS) as tyrotropine-liberating hormone and naloxon. Like the other two substances mentioned, MIP is shown to prevent death or to extend the survival period in the case of HS. It is concluded that MIP attacks the same reactive centers as naloxon, with the site of action probably being the mu-receptors. B.J.

A84-41400

**MAST CELLS AND SUBSTANCE P IN THE REGULATION OF MICROHEMODYNAMICS [TUCHNYE KLETKI I VESHCHESTVO P V REGULIATSII MIKROGEMODINAMIKI]**

M. P. GORIZONTOVA and I. P. IGNATEVA (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Patologicheskaiia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1984, p. 87-89. In Russian. refs

A84-41539

**THE REORGANIZATION OF CIRCADIAN RHYTHMS IN VARIOUS INBRED RATS AS A RESULT OF LIGHT-DARKNESS INVERSION [PERESTROIKA TSIRKADNYKH RITMOV PRI INVERSII SVETO-TEMNOVOGO TSIKLA U KRYIS RAZNYKH INBREDNYKH LINII]**

M. P. MOSHKIN, L. A. GERLINSKAIA, S. V. KUZMINOV, and N. A. ROMASHOV (Akademiia Nauk SSSR, Biologicheskii Institut; Akademiia Meditsinskikh Nauk SSSR, Novosibirsk, USSR) Zhurnal Obshchei Biologii (ISSN 0044-4596), vol. 45, Jan.-Feb. 1984, p. 132-138. In Russian. refs

Inbred WAG, August and Sprague-Dawley rats were tested for circadian rhythms of motor activity, heat production, diuresis, urination and defecation frequency following inversion of darkness and light. The rate of change of the acrophase of motor activity was found to be fastest for the August rats, and the change rate of heat production was fastest for the Sprague-Dawley rats. During the transit period the increase of phase desynchronization among the rhythms was accompanied by a decrease in the amplitude of diurnal metabolic fluctuations. The desynchronization was found to be most distinct in the August rats. The differences between the types of rats suggest the important role of genetic factors in individual reactions of an organism to the reorganization of circadian rhythms. I.H.

A84-41543

**PREVENTION OF IMPAIRMENTS IN THE FUNCTION OF HEART MITOCHONDRIA INDUCED BY EMOTIONAL AND PAINFUL STRESS [PREDUPREZHDENIE NARUSHENII FUNKTSII MITOKHONDRII SERDECHNOI MYSHTSY PRI EMOTSIONAL'NO-BOLEVOM STRESSE]**

F. Z. MEERSON, V. I. LIFANTEV, and V. V. MALYSHEV (Akademiia Meditsinskikh Nauk SSSR, Moscow; Irkutskii Meditsinskii Institut, Irkutsk, USSR) Voprosy Meditsinskoi Khimii (ISSN 0042-8809), vol. 30, Jan.-Feb. 1984, p. 119-121. In Russian. refs

It is reported in experiments with 216 male rats, that emotional and painful stress distinctly impaired oxidative phosphorylation and the  $\text{Ca}^{2+}$  transport capabilities of heart mitochondria. Gamma-hydroxybutyric acid, inderal, ional and isoptine were found to selectively inhibit the pathogenesis of stress related impairments of mitochondria in the heart. I.H.

A84-41545

**GLUCOSE-6-PHOSPHATE DEHYDROGENASE ACTIVITY IN RAT BLOOD SERUM UNDER CONDITIONS OF HYPEROXIA, HYPOXIA AND COLD [AKTIVNOST' GLUKOZO-6-FOSFATDEIDROGENAZY V SYVOROTKE KROVI KRYIS PRI GIPEROKSII, GIPOKSII I KHOLODOVOM VOZDEISTVII]**

I. A. GOROSHINSKAIA, A. A. ANANIAN, Z. G. BRONOVITSKAIA, and V. S. SHUGALEI (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, USSR) Voprosy Meditsinskoi Khimii (ISSN 0042-8809), vol. 30, Jan.-Feb. 1984, p. 60-64. In Russian. refs

The activity of glucose-6-phosphate dehydrogenase (G6PD) was found to increase in rat blood serum as a result of hyperoxia, hypoxia and cooling stress. The degree of this alteration is found to depend on the duration of exposure to the extreme conditions and on oxygen pressure. Adaptation to cooling was characterized by the stabilization of enzymatic activity at a new metabolic stage. The mechanisms of G6PD activation in blood serum under extreme conditions are discussed, as well as the possibility of taking advantage of this phenomenon in clinical testing. I.H.

A84-41546

**TIME COURSE OF THE CONTENT OF IMMUNOGLOBULINS IN RABBIT SERUM DURING EXPERIMENTAL FOOD ANAPHYLAXIS [DINAMIKA SODERZHANIIA IMMUNOGLOBULINOV V SYVOROTKE KROLIKOV V KHODE EKSPERIMENTAL'NOI PISHCHEVOI ANAFILAKSII]**

N. N. PIATNITSKII, N. M. VINOKUROVA, N. N. KOZLOVA, V. B. GERVAZIEVA, N. P. SUGONIAEVA, I. N. MAROKKO, and V. M. ZHMINCHENKO (Akademiia Meditsinskikh Nauk SSSR; Nauchno-Issledovatel'skii Institut Vaksinn i Syvorotok, Moscow, USSR) Voprosy Pitaniia (ISSN 0042-8833), Jan.-Feb. 1984, p. 44-47. In Russian. refs

A84-41557

**IMMUNOLOGICAL FUNCTION OF THE THYMUS [IMMUNOLOGICHESKAIA FUNKTSIIA TIMUSA]**

V. G. MOROZOV and V. KH. KHAVINSON (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Uspekhi Sovremennoi Biologii (ISSN 0042-1324), vol. 97, Jan.-Feb. 1984, p. 36-49. In Russian. refs

After a brief discussion of the origin, structure, and development of the thymus, the paper examines the role of the thymus in the regulation of immunogenesis. Attention is given to the production by the thymus of polypeptides which induce the formation and differentiation of T-lymphocytes. Methods for obtaining the principal factors of the thymus are examined along with the physical-chemical and biological properties of these factors. B.J.

A84-41558

**ADENOSINE, ITS METABOLISM, AND POSSIBLE MECHANISMS OF ITS PARTICIPATION IN THE FUNCTION OF IMMUNE-SYSTEM CELLS [ADENOZIN, EGO METABOLIZM I VOZMOZHNYE MEKHANIZMY UCHASTIIA V FUNKTSII KLETOK IMMUNNOI SISTEMY]**

N. P. DMITRENKO (Akademiia Nauk Ukrainsoi SSR, Institut Biokhimii, Kiev, Ukrainian SSR) *Uspekhi Sovremennoi Biologii* (ISSN 0042-1324), vol. 97, Jan.-Feb. 1984, p. 20-35. In Russian. refs

The transport, absorption, and metabolism of adenosine in lymphocytes are examined. An analysis is made of possible mechanisms of the regulatory effect of adenosine on immune-system cells, especially those cells which include adenine nucleotides (cyclic AMP, desoxynucleotides, and S-adenosilhomocysteine). Attention is given to the significance of the study of the purine metabolism in immune-system cells for immunopharmacology. B.J.

A84-41559

**FUNCTIONAL ELEMENT OF THE LIVER IN NORMAL AND PATHOLOGICAL CONDITIONS [FUNKTSIONAL'NYI ELEMENT PECHENI V NORME I PATOLOGII]**

N. IA. KOVALENKO (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) *Patologicheskai Fiziologiya i Eksperimental'naia Terapiia* (ISSN 0031-2991), Jan.-Feb. 1984, p. 83-88. In Russian. refs

The development of ideas of the structural-functional unity of the liver is examined with particular emphasis on Chernukh's (1977, 1982) concept of the functional element of organs and tissues. Consideration is given to the role of studies of the hepatic microcirculation system in the development of these ideas, as well as to the significance of current ideas about the structure of the liver for the correct understanding of the functioning of this organ in normal and pathological conditions. B.J.

A84-41560

**ROLE OF ENDOTHELIAL CELLS IN THE REGULATION OF THE METABOLIC FUNCTION OF THE LUNGS [ROL' ENDOTELIAL'NYKH KLETOK V REGULIATSII METABOLICHESKOI FUNKTSII LEGKIKH]**

I. R. TUPEEV and O. A. GOMAZKOV (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) *Patologicheskai Fiziologiya i Eksperimental'naia Terapiia* (ISSN 0031-2991), Jan.-Feb. 1984, p. 78-82. In Russian. refs

A84-41561

**A METHOD OF REPRODUCING ACUTE CHANGES OF ARTERIAL PRESSURE TO STUDY REGULATORY RESPONSES OF BRAIN VESSELS [METODIKA VOSPROIZVEDENIIA OSTRYKH IZMENENII ARTERIAL'NOGO DAVLENIIA DLIIA IZUCHENIIA REGULIATORNYKH REAKTSII SOSUDOV GOLOVNOGO MOZGA]**

M. D. GAEVYI, V. E. POGORELYI, ZH. V. SANKINA, CH. K. IKHAK, T. V. SANKINA, and M. N. IVASHEV (Piatigorskii Farmatsevticheskii Institut i Pyatigorsk, USSR) *Patologicheskai Fiziologiya i Eksperimental'naia Terapiia* (ISSN 0031-2991), Jan.-Feb. 1984, p. 72-74. In Russian. refs

A84-41562

**BARRIER FUNCTION OF THE LUNGS AND ITS ROLE IN THE ORGANISM [BAR'ERNAIA FUNKTSIIA LEGKIKH I EE ROL' V ORGANIZME]**

P. V. DUBILEI (Vologradskii Institut Fizicheskoi Kul'tury, Kazan, USSR) *Patologicheskai Fiziologiya i Eksperimental'naia Terapiia* (ISSN 0031-2991), Jan.-Feb. 1984, p. 61-63. In Russian. refs

Experiments on anesthetized dogs show that the effects of intravenous serotonin injections on arterial pressure and heart rate are 50 percent weaker than the effects of intraarterial serotonin injections. This difference is associated with the destruction of serotonin in the lungs. The blocking of lung barrier function by drugs strengthens the effects of intravenous injections in

comparison to intraarterial injections, and intensifies and prolongs hypertensive reactions in pulmonary arteries. I.H.

A84-41563

**MATHEMATICAL MODELLING OF TWO PATHWAYS OF LIGHT PERCEPTION IN A PHOTORECEPTOR CELL [MATEMATICHESKOE MODELIROVANIE DVOUKH PUTEI VOSPRIIATII SVETA FOTORETSEPTORNOI KLETKOI]**

V. S. MARKIN and V. P. SKULACHEV (Akademiia Nauk SSSR, Institut Elektrokhemii i Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Biofizika* (ISSN 0006-3029), vol. 29, Jan.-Feb. 1984, p. 167-176. In Russian. refs

A mathematical model of two pathways of light excitation is developed on the basis of the concept that rhodopsin has a polyfunctional role in light excitation in photoreceptor cells. The first pathway is associated with the appearance of  $\text{Ca}^{2+}$  ions in the cell which block sodium channels. The second pathway results in the splitting of cyclic GMP which also blocks sodium channels. A change in the concentration of active agents and in the process of cell excitation under illumination is calculated, and it is found that for calcium the change is rapid and direct, but not very sensitive. The operating time for calcium does not depend on illumination, while the operating time of the cyclic GMP branch decreases as illumination increases and is in inverse proportion to the square root of flash intensity. After repeated illumination the amplitude of calcium response decreases and its time remains constant. In cyclic GMP the response time for the second flash is found to decrease. I.H.

A84-41574

**BIOGENIC MONOAMINES AND THE SEIZURE SUSCEPTIBILITY OF THE BRAIN [BIOGENNYE MONOAMINY I SUDOROZHNAIA GOTOVOST' GOLOVNOGO MOZGA]**

F. P. VEDIAEV and N. G. SERGIENKO (Khar'kovskii Meditsinskii Institut, Kharkov, Ukrainian SSR) *Uspekhi Fiziologicheskikh Nauk* (ISSN 0301-1798), vol. 15, Jan.-Mar. 1984, p. 55-75. In Russian. refs

The relationship between the monoaminergic systems (noradrenergic, dopaminergic, and serotonergic) of the brain and seizure susceptibility (SS) is examined with reference to the development of an epilepsy therapy. It is shown that the monoaminergic mediation system of the brain is an important factor in the formation of potential SS. The sufficient activity of serotonergic processes appears to be necessary for the normal functioning of the inhibitory mechanisms of the CNS. Genetically or functionally conditioned insufficiency in the serotonergic mediation system can generate conditions for pathologically intensified excitation. B.J.

A84-42253

**AVERAGE SAR AND SAR DISTRIBUTIONS IN MAN EXPOSED TO 450-MHZ RADIOFREQUENCY RADIATION**

A. W. GUY, C.-K. CHOU, and B. NEUHAUS (Washington, University, Seattle, WA) *IEEE Transactions on Microwave Theory and Techniques* (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 752-763. refs

(Contract F33615-80-C-0612)

Fifth-scale phantom models were exposed to 2450-MHz electromagnetic fields to obtain the average specific absorption rate (SAR) and SAR distribution in man exposed to 1 mW/sq cm 450-MHz radiofrequency radiation for various polarizations and body positions. The average SAR was measured calorimetrically and SAR distribution was determined thermographically using an interactive computer system. The mean SAR, as averaged over the body, remained relatively constant at 0.050 W/kg, with a standard deviation of  $\pm$  0.007 W/kg for all polarizations and body postures considered in the study. Peak SAR values were as high as 0.650 W/kg, occurring typically in the wrist. Author

A84-42524

CHANGES IN THE EFFICIENCY OF OXIDATIVE PHOSPHORYLATION, RESPIRATORY RATE, AND  $Ca^{2+}$  ION TRANSPORT IN RAT AND GROUND SQUIRREL LIVER MITOCHONDRIA FOR DIFFERENT LEVELS OF THERMOGENESIS [IZMENENIYA EFFEKTIVNOSTI OKISLITEL'NOGO FOSFORILIROVANIYA, SKOROSTI DYKHANIYA I TRANSPORTA IONOV  $Ca^{2+}$  V MITOKHONDRIYAKH PECHENI KRYS I SUSLIKOV PRI RAZLICHNYKH UROVNIYAKH TERMOGENEZA]

N. N. BRUSTOVETSKII, E. I. MAEVSKII, L. S. DANILOVA, S. G. KOLAEVA, and G. R. IVANITSKII (Akademiya Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Akademiya Nauk SSSR, Doklady (ISSN 0002-3264), vol. 276, no. 5, 1984, p. 1260-1263. In Russian. refs

A84-42525

THE PROTECTIVE EFFECT OF HYPOXIC PREADAPTATION ON THE ANIMAL MORTALITY RATE FROM ACUTE CIRCULATORY DISORDERS CAUSED BY INTENSE EXCITATION OF THE BRAIN [PREDOKHRANENIYE VLIYANIYA PREDVARITEL'NOI GIPOKSICHESKOI ADAPTATSII NA SMERTNOST' ZHIVOTNYKH OT OSTRYKH NARUSHENII KROVOOBRAZHENIYA, VYZVANNYKH SIL'NYM VOZBUZHDENIEM MOZGA]

V. B. KOSHELEV, A. L. KRUSHINSKII, and M. N. SOTSKAIA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Akademiya Nauk SSSR, Doklady (ISSN 0002-3264), vol. 276, no. 5, 1984, p. 1274-1276. In Russian. refs

A84-42630

ELECTRICAL ACTIVITY OF THE BRAIN - MECHANISMS AND INTERPRETATION

S. M. OSOVETS, D. A. GINZBURG, V. S. GURFINKEL, L. P. ZENKOV, L. P. LATASH, V. B. MALKIN, P. V. MELNICHUK, and E. B. PASTERNAK (Akademiya Nauk SSSR, Institut Atomnoi Energii and Institut Problem Peredachi Informatsii and Institut Mirovoi Literatury; Moskovskii Oblastnoi Nauchno-Issledovatel'skii Klinicheskii Institut; I Moskovskii Meditsinskii Institut, Moscow, USSR) (Uspekhi Fizicheskikh Nauk, vol. 141, Sept. 1983, p. 103-150) Soviet Physics - Uspekhi (ISSN 0038-5670), vol. 26, Sept. 1983, p. 801-828. Translation. refs

Dynamic analogies are used to develop ideas on the origin of the electrical rhythms of the brain. The theory of nonlinear oscillations is used to explain the structure of EEG activity and of the mechanism responsible for it and to present ideas of the functional significance of brain rhythms. Existing phenomenology and current hypotheses are used as a basis for suggesting that spontaneous rhythms on EEGs are due to the interaction between autogenerators formed by neuronal populations of thalamic nuclei and functional units in the cortex which exhibit the properties of a passive oscillatory loop. The process by which this interaction is manifested in EEG activity and in the appearance of certain specific types of epilepsy is described. I.H.

N84-28865# Joint Publications Research Service, Arlington, Va. SPACE BIOLOGY AND MEDICINE: YESTERDAY AND TODAY

O. G. GAZENKO In its USSR Rept.: Space (JPRS-USP-84-003) p 86-93 14 Jun. 1984 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep.-Oct. 1983 p 4-8 Original language document announced as A84-32369

Avail: NTIS HC A07

The progress of Soviet space biology and medicine is traced from the respective space flights of Laika, the space dog, in 1957, and Yuri Gagarin, the cosmonaut, aboard the Vostok in 1961 to the Kosmos series of biosatellites launched between 1973 and 1983. It is noted that centrifuge experiments aboard the Kosmos-936 demonstrated that the simulation of gravity in weightlessness prevents the development of many negative effects associated with weightless conditions. Important findings regarding the response of the human organism to intended space missions resulted from the Salyut-7 missions. Data on the functioning of

the cardiovascular system and on red blood cell count are cited. R.J.F.

N84-28866# Joint Publications Research Service, Arlington, Va. DEVELOPMENT OF EQUIPMENT FOR 'COSMOS-1514' BIOSATELLITE

T. CHESANOVA In its USSR Rept.: Space (JPRS-USP-84-003) p 94-97 14 Jun. 1984 Transl. into ENGLISH from Leningr. Pravda (USSR), 23 Dec. 1983 p 4

Avail: NTIS HC A07

The development of life support and bio-monitoring equipment on the Cosmos 1514 biosatellite is discussed. The equipment was used to support and monitor the monkey passengers. Problems in adapting monitoring equipment to the curious and destructive monkeys are emphasized. R.J.F.

N84-28868# Joint Publications Research Service, Arlington, Va. INVESTIGATING SPATIAL DISTRIBUTION OF PHYTOPLANKTON IN LAKE BAYKAL BY OPTICAL METHODS Abstract Only

F. Y. SIDKO, P. P. SHERSTYANKIN, A. D. APONASENKO, L. A. SHUR, N. A. FRANK, and A. F. SIDKO In its USSR Rept.: Space (JPRS-USP-84-003) p 101 14 Jun. 1984 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 11-14

Avail: NTIS HC A07

It is argued that the total biomass and productivity of phytoplankton can be judged from the concentration of chlorophyll a. distribution of phytoplankton chlorophyll in Lake Baykal was studied. It was found that water transparency in August 1976 was 4.5-9 m, with the chlorophyll content varying from 0.50 mg/cubic along the eastern shore in the northern part of the lake to 1.5 mg/meters along the western shore; in the open part of the lake the chlorophyll concentration was 0.5-1.0 mg/meters. Lower concentrations were observed in July 1977. The chlorophyll concentration maximum was usually at a depth two or three times greater than the transparency depth. The brightness of water body surfaces is dependent on the content and size distribution function of hydrosol particles. With a decrease in water transparency the reflection maximum is displaced into the long-wave region. In the spectra of the brightness coefficients there is registry of chlorophyll absorption, especially the red absorption band, from which it is possible to evaluate the content of phytoplankton chlorophyll in the surface layers of water bodies. R.J.F.

N84-29432\*# Hampton Inst., Va.

A RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF LASER INDUCED FLUORESCENCE OF PHYTOPLANKTON IN NON-HOMOGENEOUS TURBID WATER Final Technical Report

D. D. VENABLE 1983 87 p refs

(Contract NCC1-11)

(NASA-CR-173777; NAS 1.26:173777) Avail: NTIS HC A05/MF A01 CSCL 06A

A semi-analytic Monte Carlo simulation methodology (SALMON) was discussed. This simulation technique is particularly well suited for addressing fundamental radiative transfer problems in oceanographic LIDAR (optical radar), and also provides a framework for investigating the effects of environmental factors on LIDAR system performance. The simulation model was extended for airborne laser fluorosensors to allow for inhomogeneities in the vertical distribution of constituents in clear sea water. Results of the simulations for linearly varying step concentrations of chlorophyll are presented. The SALMON technique was also employed to determine how the LIDAR signals from an inhomogeneous media differ from those from homogeneous media. R.S.F.

## 51 LIFE SCIENCES (GENERAL)

**N84-29433\*#** State Univ. of New York, Binghamton.  
**BIOCIDAL QUATERNARY AMMONIUM RESIN Final Report**  
G. E. JANAUER Nov. 1983 33 p refs  
(Contract NAS9-16604)  
(NASA-CR-171802; NAS 1.26:171802) Avail: NTIS HC A03/MF A01 CSDL 06A

Activated carbon (charcoal) and polymeric resin sorbents are widely used in the filtration and treatment of drinking water, mainly to remove dissolved organic and inorganic impurities and to improve the taste. Earlier hopes that activated carbon might 'disinfect' water proved to be unfounded. The feasibility of protecting against microbial infestation in charcoal and resin beds such as those to be incorporated into total water reuse systems in spacecraft was investigated. The biocidal effect of IPCD (insoluble polymeric contact disinfectants) in combination with a representative charcoal was assessed. The ion exchange resins (IPCD) were shown to adequately protect charcoal and ion exchange beds. R.S.F.

**N84-29434#** Washington Univ. Hospital, Seattle.  
Bioelectromagnetics Research Lab.  
**EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 6: HEMATOLOGICAL, SERUM CHEMISTRY, THYROXINE, AND PROTEIN ELECTROPHORESIS EVALUATIONS Final Report, 1 Jun. 1980 - 31 Mar. 1983**  
L. L. KUNZ, R. B. JOHNSON, D. THOMPSON, J. CROWLEY, and C. K. CHOU Mar. 1984 106 p  
(Contract F33615-80-C-0612; AF PROJ. 7757)  
(AD-A141124; USAFSAM-TR-84-2) Avail: NTIS HC A06/MF A01 CSDL 06R

The blood parameters were evaluated for rats exposed to 2450-MHz 480-microwatts/sq cm (10-microsecond pulse, 800 pps, 8-Hz modulation) in circularly polarized waveguides for 21 hours a day for 25 months. The results of the hematology, serum chemistry, protein electrophoresis, and thyroxine evaluations show no significant points in time or on expected age-related baseline value changes. GRA

**N84-29435#** Science and Education Administration, Gainesville, Fla. Insects Affecting Man Animals Research Lab.  
**EVALUATION OF INSECTICIDES, REPELLENTS, AND OTHER APPROACHES TO THE CONTROL OF COASTAL STAND FLIES, CULICOIDES SPP Final Report**  
D. L. KLINE 1 May 1984 29 p  
(Contract N00014-79-F-0070)  
(AD-A141132) Avail: NTIS HC A03/MF A01 CSDL 06F

Population dynamics and control studies on Culicoides biting midges were conducted at Parris Island, South Carolina, and Yankeetown, Florida, from September 15, 1979, through September 30, 1983. Population dynamics included studies on species composition, seasonal incidence, and relative abundance of adult Culicoides, and spatial and temporal patterns of larval abundance. Three species at each study site were abundant enough to be considered major pests: Culicoides furens, C. hollensis and C. melleus at Parris Island; and C. barbosai, C. furens and C. mississippiensis at Yankeetown. Culicoides furens is the dominant species from late spring through early fall. Culicoides hollensis and C. mississippiensis are predominant in the spring and fall. Plant cover was a good indicator of larval spatial and temporal distribution. Remote sensing techniques were evaluated and found useful for identification of major marsh plant types both qualitatively and quantitatively. In the laboratory, C. mississippiensis was successfully reared at 20 deg C from eggs obtained from wild-caught blood-fed females. Reared females were 100% autogenous. Insecticidal control studies included laboratory evaluations of adulticides and larvicides, residual applications of insecticides on treated screens, and ground and aerial ULV applications. These laboratory evaluations identified several promising aerosol adulticides (e.g., resmethrin, malathion, naled), larvicides (chlorpyrifos, temephos) and window screen treatments (permethrin, NRDC-161, propoxur). GRA

**N84-29436#** Desmatics, Inc., State College, Pa.  
**COMPARISON OF RHESUS MONKEY AND BABOON -G SUB X ACCELERATION EXPERIMENTS**  
K. C. BURNS May 1984 19 p  
(Contract N00014-79-C-0128)  
(AD-A141395; TR-112-16) Avail: NTIS HC A02/MF A01 CSDL 06S

NBDL -Gx acceleration rhesus experiments are compared to the results of Clarke et al., with baboons using the Air Force shoulder harness-lap belt restraint. Baboons are shown to have significantly less tolerance to -Gx acceleration. The differential effect of peak sled acceleration is shown to be the same for each species. The statistical models used are logistics response functions of peak sled acceleration and the initial yaw angle of the head. GRA

**N84-29437#** Arizona Univ., Tucson. Coll. of Business and Public Administration.  
**INFORMATION SEARCH IN JUDGMENT TASKS: THE EFFECTS OF UNEQUAL CUE VALIDITY AND COST Interim Technical Report**  
T. CONNOLLY and P. SERRE May 1984 31 p  
(Contract N00014-83-K-0742)  
(AD-A141712; ONR-84-1) Avail: NTIS HC A03/MF A01 CSDL 05A

The broad question addressed by this research is: How good are humans at balancing the costs and benefits of their information acquisition? Do they buy those, and only those, sources of information whose acquisition cost is outweighed by the improvement in decision quality that their use makes possible? The evidence reported here, together with that reviewed earlier, suggests that the answer is not encouraging. Specifically, the present findings extend those noted earlier in suggesting: (1) That the pattern of overpurchase for low-consequence decisions, and underpurchase for high-consequence decisions, is robust to variation in overall cue validity, as well as to procedural modifications such as manual versus computer-interactive transactions (Experiment 1), (2) That overpurchase is frequently coupled with mispurchase (Experiments 2 & 3). That is, subjects, in addition to buying overall more information than was normatively justified, frequently bought expensive cues when cheap, equally-valid ones were available (Experiment 2), or low-validity cues when higher-validity, equally-costly cues were available (Experiment 3), (3) That subjects perceive equally-valid cues as of differential validity (Experiments 1 & 2), and are able to detect real validity differences between cues reliably only when the differences are large (Experiment 3). Purchase behavior is generally shaped by these perceptions of validity, whether well-founded or not, though the relationship disappears when equally-valid cues are offered at different costs (Experiment 2). GRA

**N84-29438#** New York State Dept. of Health, Albany. Center for Labs. and Research.  
**METHANE PRODUCING BACTERIA: IMMUNOLOGICAL CHARACTERIZATION Final Report, 1 Apr. 1981 - 31 Mar. 1984**  
E. C. DEMACARIO, A. J. L. MACARIO, and M. J. WOLIN Mar. 1984 16 p refs  
(Contract DE-AC02-81ER-10880)  
Avail: NTIS HC A02/MF A01

Methanogenic bacteria, or methanogens, were studied systematically with immunologic techniques. A comprehensive bank of reference antisera was organized from which calibrated antibody probes were generated of high resolution power for rapid bacterial identification and classification, and for examining samples from complex ecosystems. A method was standardized for antigenic fingerprinting methanogens. It was found that these bacteria form an immunologically coherent group, with subgroups of antigenically related members. Antigenic relationships paralleled the phylogenetic organization delineated by comparisons of 16S rRNA nucleotide sequences, and by cell wall chemistry. Immunologic data emerged as one of the three basic tenets of the notion that methanogens belong in a third primary kingdom, the archaebacteria, evolutionarily different from eubacteria and eukaryotes. The finding,



methods and antibodies produced were useful monitoring the bacterial flora of bioreactors. Direct examination of specimens is now possible by simple and specific immunologic procedures, in a few hours.  
E.A.K.

**N84-29439#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

**AN OPTIMAL CONTROL PROBLEM IN THE STUDY OF LIVER KINETICS**

K. HOLMAKER 1984 20 p refs Submitted for publication (CTH-MATH-1984-10; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

For a substance in the blood transformed twice by different kinds of enzymes, the distribution of the enzymes along the blood flow so that the outflow concentration of the once-transformed form of the substance is as small as possible is considered. The problem is solved for general types of kinetics (including substrate-inhibition kinetics). The problem is considered as an optimal control problem, and Pontryagin's maximum principle is applied to derive necessary conditions.  
Author (ESA)

**N84-30642#** Joint Publications Research Service, Arlington, Va. **USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 18, NO. 3, MAY - JUNE 1984**

O. G. GAZENKO, ed. 3 Jul. 1984 146 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 96 p (JPRS-USB-84-005) Avail: NTIS HC A07

The effects of the aerospace environment on human and animal systems are investigated. Topics include the physiological effects of orthostatic positioning, hyperthermia, hypokinesia, work capacity, respiration and oxygen metabolism, and weightlessness simulation studies.

**N84-30651#** Joint Publications Research Service, Arlington, Va. **DYNAMICS OF RED BLOOD CELL CHANGES IN RATS DURING ACUTE IMMOBILIZATION**

L. N. KATYUKHIN and M. N. MASLOVA In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 58-64 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 43-47  
Avail: NTIS HC A07

The standard clinical parameters of red blood, morphometric characteristics, membrane resistance and electrolyte balance of red blood cells of white rats exposed to acute immobilization were investigated. It was found that the immobilization of rats in small-size cages produced statistically significant changes in the concentration of ascorbic acid in the adrenals and oxycorticosteroids in plasma, as well as erythrocytosis, reduction of red blood cell size, planocytosis and decrease of intracellular sodium. The above parameters did not return to the norm 24 hours after 3-hour immobilization. It is suggested to use the amount of plasma per red blood cells as a stress-marker in red blood.  
Author

**N84-30652#** Joint Publications Research Service, Arlington, Va. **ULTRASOUND DISTRIBUTION AND BONE CALCIUM CONTENT IN EXPERIMENTAL ANIMALS SUBMITTED TO HYPOKINESIA AND WEIGHTLESSNESS**

Y. Z. SAULGOZIS, V. Y. NOVIKOV, M. A. DOBELIS, Y. A. ILIN, and V. I. LEBEDEV In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 65-71 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 48-52  
Avail: NTIS HC A07

The velocity of ultrasonic propagation, calcium content and femur size of rats exposed to actual and simulated weightlessness were investigated. The exposure slowed down the ultrasonic velocity in bones. The effect of the calcium content on the ultrasonic velocity in various bone sites was different: as a rule there was a positive correlation in diaphyses and negative correlation in

epiphyses. These specific features should be taken into consideration when new methods of bone ultrasonic diagnostics are developed.  
Author

**N84-30653#** Joint Publications Research Service, Arlington, Va. **ULTRASONOGRAPHY OF CANINE SOFT TISSUES DURING DECOMPRESSION**

V. P. NIKOLAYEV, V. P. KATUNTSEV, R. T. KAZAKOVA, K. S. YUROVA, T. D. DORONINA, A. D. MANSFELD, P. K. CHICHAGOV, and A. M. REYMAN In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 72-78 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 52-57  
Avail: NTIS HC A07

Ultrasonic location of femoral soft tissues of anesthetized dogs was performed using a modified unit UZKAP-3. The animals were exposed to 0.5 mPa for 2 hours and then to decompression to sea level pressure. The concomitant echographic changes pointed to the formation of extra- and intra-vascular gas bubbles in the above tissues. The bubbles could be identified visually in the nearest echographic band because the instrumentation used made it possible to eliminate the background image of structural inhomogeneities of the tissue layer.  
Author

**N84-30655#** Joint Publications Research Service, Arlington, Va. **ADRENAL-HYPOTHALAMUS-PITUITARY SYSTEM REACTIONS IN RATS COOLED IN A HYPOXIC-HYPERCAPNIC GAS ATMOSPHERE**

S. S. MOGUTOV, Y. S. SERGEYEVA, and V. P. YEVGRAFYEV In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 84-90 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 61-65  
Avail: NTIS HC A07

The rearrangement of the adrenal-hypothalamus-pituitary system of rats kept in a low temperature hypoxic-hypercapnic atmosphere was investigated. Phasic changes of the system were detected, with their magnitude and sign depending on the exposure time. The central and peripheral components of the system developed specific relations. One of the peculiarities of the responses of the adrenal-hypophysis-pituitary (sic) system to the above exposure is a limited range of changes in the neuroendocrine activities due to a total reactivity decrease. This protects the neuroendocrine system from overstrain or involvement in overshooting reactions. It is assumed that this type of response of the adrenal-hypophysis-pituitary (sic) system is important to help understand mechanisms of the neuroendocrine regulation of the adaptive process developing in response to the combined effect.  
Author

**N84-30657#** Joint Publications Research Service, Arlington, Va. **RAT BEHAVIOR IN SELECTION OF NEGATIVE STIMULUS: PAIN OR EXPOSURE TO ELECTROMAGNETIC FIELD**

B. I. DAVYDOV, I. B. USHAKOV, V. S. TIKHONCHUK, and A. A. GALKIN In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 96-99 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 68-71  
Avail: NTIS HC A07

An experimental model of two conflicting motives was developed and tested on rats. The motives are to escape a painful stimulation and subsequent microwave irradiation at a dose rate of 500 mWt/sq cm under normal conditions and disturbed thermal regulation due to gamma irradiation of the head. It is found that microwave effects cannot be entirely attributed to the body temperature gradient.  
Author

## 51 LIFE SCIENCES (GENERAL)

**N84-30664\*#** National Aeronautics and Space Administration, Washington, D. C.

**NASA SPACE BIOLOGY ACCOMPLISHMENTS, 1983-84**

T. W. HALSTEAD, F. R. DUTCHER (George Washington Univ.), and L. G. PLEASANT (George Washington Univ.) Aug. 1984 123 p

(Contract NASW-3165)

(NASA-TM-86654; NAS 1.15:86654) Avail: NTIS HC A06/MF A01 CSCL 06B

Approximately 42 project summaries from NASA's Space Biology Program are presented. Emphasis is placed on gravitational effects on plant and animal life. The identification of gravity perception; the effects of weightlessness on genetic integrity, cellular differentiation, reproduction, development, growth, maturation, and senescence; and how gravity affects and controls physiology, morphology, and behavior of organisms are studied.

E.R.

**N84-30665\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

**GLOBAL BIOLOGY RESEARCH PROGRAM: BIOGEOCHEMICAL PROCESSES IN WETLANDS**

D. S. BARTLETT, ed. Washington Aug. 1984 43 p refs Workshop held in Arlington, 22-24 Mar. 1983

(NASA-CP-2316; L-15791; NAS 1.55:2316) Avail: NTIS HC A03/MF A01 CSCL 13B

The results of a workshop examining potential NASA contributions to research on wetland processes as they relate to global biogeochemical cycles are summarized. A wetlands data base utilizing remotely sensed inventories, studies of wetland/atmosphere exchange processes, and the extrapolation of local measurements to global biogeochemical cycling processes were identified as possible areas for NASA support.

**N84-30666\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

**EXECUTIVE SUMMARY: BACKGROUND**

*In its* Global Biol. Res. Program. Biogeochem. Process. in Wetlands p 1-6 Aug. 1983

Avail: NTIS HC A03/MF A01 CSCL 13B

Background information on, and the objectives of, the NASA Global Biology Research Program are given. The following issues were addressed: (1) geographic distribution of wetland parameters, (2) the processes of wetland material fluxes, and (3) the relation of local fluxes with global processes. Wetland inventorying and categorizing, gas-phase exchanges with the atmosphere, material exchange with the aquatic environment, and material storage in wetland sediments were identified as topics requiring further research.

R.S.F.

**N84-30667\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

**GEOGRAPHIC DISTRIBUTION OF WETLAND PARAMETERS: THE FOUNDATION OF A DATA BASE**

*In its* Global Biol. Res. Program. Biogeochem. Process. in Wetlands p 6-14 Aug. 1984

Avail: NTIS HC A03/MF A01 CSCL 13B

Few quantitative estimates exist concerning the large fluxes of various materials between wetlands and adjacent bodies of water and the atmosphere. Three areas research were identified which will aid in the quantitative assessment of wetland biogeochemical processes: (1) geographic distribution of wetland parameters, (2) the processes involved in wetland material fluxes, and (3) the extrapolation of local measurements of material fluxes and storage to large geographic areas.

R.S.F.

**N84-30668\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

**A FRAMEWORK FOR WETLANDS RESEARCH: DEVELOPMENT OF A WETLANDS DATA BASE**

*In its* Global Biol. Res. Program. Biogeochem. Process. in Wetlands p 14-32 Aug. 1983

Avail: NTIS HC A03/MF A01 CSCL 13B

Issues related to the assembly of a comprehensive global wetlands data base are presented. A strategy to collect relevant data for wetland ecosystems through remote sensing inventories of wetland distribution was discussed. Elements of a research program on biogenic gas fluxes were identified. The major wetland parameters and their functional importance to material exchange mechanisms are summarized.

R.S.F.

**N84-30669#** School of Aerospace Medicine, Brooks AFB, Tex. **DELAYED EFFECTS OF PROTON IRRADIATION IN MACACA MULATTA. 3: GLUCOSE INTOLERANCE Interim Report, 1964 - 1983**

Y. L. SALMON, M. G. YOCHMOWITZ, and D. H. WOOD Mar. 1984 28 p

(Contract AF PROJ. 1921; AF PROJ. 7757)

(AD-A142289; USAFSAM-TR-84-7) Avail: NTIS HC A03/MF A01 CSCL 06R

A group of rhesus monkeys is being studied in a lifetime survey of the delayed effects of proton irradiation. The animals were exposed during the period 1964 - 1969 to single total-body doses of protons covering the spectrum of energies and total doses that might be expected to occur in space during a major solar flare event. This report describes the results of intravenous glucose tolerance test and the insulin response to glucose challenge in 106 irradiated animals, their control group of 42, and 10 younger control animals. The results indicate that the clearance rate of blood glucose is influenced by the age of the animal and by the type and energy of the radiation. Animals receiving greater than 360 rads of proton irradiation of energies above 138 MeV had significantly slower glucose clearance than nonirradiated controls. Seventeen-twenty-year-old controls were less glucose tolerant than 9-11-year-old controls. Animals with normal glucose tolerance showed considerable individual variation in insulin response, while in animals with marked glucose intolerance (clearance rate < 1.0 %/min), low insulin response was a consistent finding.

GRA

**N84-30670#** Utah Univ., Salt Lake City. Dept. of Electrical Engineering.

**BIOLOGICAL EFFECTS OF MILLIMETER-WAVE IRRADIATION: LIVING BACTERIAL ORGANISMS Final Report, 15 Jul. 1982 - 14 Oct. 1983**

O. P. GANDHI, D. W. HILL, L. FURIA, M. F. ISKANDER, and D. GHODGAONKAR Brooks AFB, Tex. School of Aerospace Medicine Apr. 1984 37 p

(Contract F33615-82-K-0631)

(AD-A142474; UTEC-83-84004; USAFSAM-TR-84-11) Avail: NTIS HC A03/MF A01 CSCL 06R

The report describes experiments on the effects of millimeter-wave irradiation on the mutation rates of *Salmonella typhimurium* strain TA 1535 and TA 1538. No frequency-sensitive irradiation effects have been observed in spite of closely spaced frequencies used in the 42-48 and 65-75 GHz bands. Some preliminary experiments performed with yeast *Saccharomyces cerevisiae* have given rates of growth that are dependent on the irradiation frequency. However, on account of the high degree of variability, accurate frequency resettability is a must before firm conclusions can be drawn. A new method for measuring complex permittivities of biological media in vitro and in vivo has been proposed and tested for feasibility. Raman laser spectroscopy is proposed as a means of searching for frequency-specific biological effects of millimeter-wave irradiation. The Raman system setup for these studies is used for pilot studies with vesicular stomatitis, Sindbis, and LaCrosse viruses and with bacillus megaterium.

GRA

**N84-30671#** Baylor Coll. of Medicine, Houston, Tex. Dept. of Physiology.

**INTERNATIONAL WORKSHOP ON BIOPHYSICAL CORRELATES OF CELLULAR FUNCTION UNESCO Final Report, 1 Apr. 1983 - 31 Mar. 1984**

C. F. HAZLEWOOD 3 May 1984 10 p

(Contract N00014-83-G-0056)

(AD-A142490) Avail: NTIS HC A02/MF A01 CSCL 06P

The scientific sessions began with three lectures which provided a broad overview of our current understanding of cellular structure and function. These lectures set the stage for the remainder of the workshop which involved the presentation of data related to the interrelationships between cellular function and structure, the latest concepts of cellular transport processes, the physical state of water and ions in cells, and divergent view of cellular function. In addition to these, the last session dealt with the applications of new technologies to the broad range of biophysical problems which were discussed throughout the workshop. The role of membranes and the cytoplasm in the control of the cellular environment were of major focus during the Tuesday and Wednesday sessions. The latest information on membrane transport proteins were presented by leading authorities in this field. New information on the role of the cytoplasmic matrix in the control of the cellular environment was presented and extensively discussed. There emerged what appears to be a consensus that a significant amount of ion binding is present in cell membranes as well as the cytoplasmic matrix. In addition, new information was presented on the diffusive motion and the relaxation processes of water molecules in various cellular systems. GRA

**N84-30672#** California Univ., Davis. Lab. for Energy Related Health Research.

**LABORATORY FOR ENERGY RELATED HEALTH RESEARCH Annual Report, 1982**

Aug. 1983 180 p refs

(Contract DE-AC03-76SF-00472)

(DE84-000529; UCD-472-128; AR-17) Avail: NTIS HC A09/MF A01

This is the 17th Annual Report of the Laboratory for Energy Related Health Research. The current Laboratory program can be segregated into radiation studies and studies on fossil energy. This year's report includes status reports on the metabolism, dosimetry, and pathology of bone seeking radiostrontium and radium in dogs. An interesting development is the apparent increase in bone tumor latency with decreasing skeletal dose and the influence of radiation quality on this endpoint. While (226)Ra caused dose related effects in the eye, (90)Sr does not. Continual exposure to external irradiation almost always induces myeloid leukemia if the exposure begins in utero. These dogs are also resistant to lethal aplasia which is normally seen at intermediate dose rates in post natally irradiated animals. Studies on radiation effects on cells include marrow cells from irradiated animals as well as determination of responses of hematopoietic cells and their progenitors to radiation and other tests in vitro. Study of lymphocytes from preleukemic patients show interesting functional differences compared to normal values. New techniques were developed to reevaluate histocompatibility and response to stimulation. New information is being derived about acute and chronic irradiation effects on spermatogenesis. DOE

**N84-30673#** Minnesota Univ., Minneapolis.

**VERTEBRATE BEHAVIOR AND ECOLOGY Final Report, 16 Oct. 1967 - 31 May 1983**

J. R. TESTER and D. B. SINIFF Feb. 1984 29 p refs

(Contract DE-AC02-76EV-01332)

(DE84-007318; DOE/EV-01332/1) Avail: NTIS HC A03/MF A01

Radio telemetry engineering, design and development has focused on high power transmitters, ultrasonic receivers and transmitters, corrosive links, high frequency transmitters and implanted transmitters. Ranges from implanted transmitters are approximately 4 to 10 times less than from external transmitters due to fundamental limitations of small antennas. Social

organization, movements, activities, foraging strategies, and population dynamics of sea otters (*Enhydra lutris*) were investigated from 1979 to 1982 in Prince William Sound, Alaska. It was found that otters in newly occupied male areas spent 23% less time feeding but obtained 38% more calories per day than otters in the area of prolonged occupation where food was less abundant. Reduction of boat traffic during winter in most recently occupied male areas prompted large seasonal influxes of otters. Females were capable of reproducing annually, but rarely did so under food stressed conditions. The population segment in the male areas increased at a rate of 50% per year as male pups dispersed from all parts of the Sound into this region, and few animals died. DOE

**N84-30674#** Connecticut Univ., Storrs. Inst. of Water Resources.

**SALINITY AND TEMPERATURE EFFECTS ON PHOTOSYNTHESIS AND ORGANIC CARBON RELEASE RATES BY SELECTED BENTHIC MACROALGAE**

H. YARISH and M. HELLER Sep. 1983 53 p refs

(Contract DL-14-34-0001-2107)

(PB84-163146; OWRT-A-091-CONN(1)) Avail: NTIS HC A04/MF A01 CSCL 08A

Estuarine benthic macroalgae are excellent producers of new carbonaceous material through their high rates of photosynthesis. Under some circumstances, this organic carbon is liberated into the aquatic environment in dissolved form while the plant is actively photosynthesizing. This project established a protocol for examining the effects of different combinations of salinity, temperature, and emergence/submergence regimes, determined the effects of antibiotics on the photosynthetic rate, and the extent to which these factors effect liberation of organics by selected estuarine benthic macroalgae. GRA

**N84-30675#** Joint Publications Research Service, Arlington, Va. **USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES**

30 Jul. 1984 120 p refs Transl. into ENGLISH from various Russian articles

(JPRS-UBB-84-016) Avail: NTIS HC A06

Topics in biological, biomedical, and behavioral science were addressed. The following subject areas were considered: agriculture, biochemistry, biophysics, biotechnology, ecology, epidemiology, food technology, genetics, human factors engineering, immunology, laser effects, microbiology, military medicine, nonionizing electromagnetic radiation effects, pharmacology, toxicology, physiology, public health, psychology, veterinary medicine, and virology.

**N84-30677#** Joint Publications Research Service, Arlington, Va. **BILATERAL CAROTID LIGATION AND EFFECTS OF ELECTROMAGNETIC FIELD ON CONDITIONED REFLEX RETENTION AND CEREBRAL NUCLEIC ACID LEVELS Abstract Only**

S. V. RUTSAY and I. S. SURKOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 65 30 Jul. 1984 Transl. into ENGLISH from Byul. Eksperim. Biol. i Med. (Moscow), no. 5, May 1983 p 62-64

Avail: NTIS HC A06

The retention of an avoidance conditioned reflex and the cerebral cortical levels of DNA and RNA in outbred rats subjected to bilateral carotid ligation and subsequent exposure to a decimeter-wave electromagnetic field (EMF) were investigated. Ligation of the carotids led to deterioration of the conditioned response, with further decrease in performance seen in animals subjected to the EMF within two hours of operation. Re-exposure to the EMF after two days actually improved performance on the avoidance test in some rats, but in the majority (63.6 %) significant clinical deterioration which terminated in convulsions and death was observed. Exposure of unoperated control animals to the EMF was without effect. Biochemical studies showed that the EMF potentiated DNA and RNA synthesis in the brain stem to above-control levels. In the cerebral cortex, EMF-induced RNA

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synthesis exceeded slightly the control level, while DNA synthesis increased to an intermediate level between unoperated controls and ligated, but unirradiated, animals. These findings point to the considerable individual variability in the responses of animals to EMF, and suggest that caution be exercised in the use of EMF for the treatment of carotid insufficiency in humans. Author

**N84-30678#** Joint Publications Research Service, Arlington, Va. **TIME-DEPENDENT SPINAL CORD CHANGES FOLLOWING NONIONIZING MICROWAVE IRRADIATION Abstract Only**  
V. S. BELOKRINITSKIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 66 30 Jul. 1984 Transl. into ENGLISH from Byul. Eksperim. Biol. i Med. (Moscow), no. 5, May 1983 p 98-100  
Avail: NTIS HC A06

The spinal cords of dogs and cats subjected to nonionizing microwave irradiation were investigated using histopathological methods. Sequential studies covering days 2 to 30 showed that the changes in both species were analogous despite differences in duration of exposure (one hr in cats and four hr in dogs), with initial changes evident within a day of the insult. The salient features were dystrophic changes and destruction of the neurons and glial activation. The neuroglial activation. The changes were progressive, and by day 10 more than 50% of the neurons were destroyed, while the initial hyperplasia of the glial elements was replaced by degenerative changes. Synaptic structures were also affected and underwent progressive dissolution; the synapses on the larger motor neurons were more refractory to destruction. The histopathology findings observed in the experimental animals can be correlated with clinical findings in humans exposed to microwave irradiation. Author

**N84-30681#** Joint Publications Research Service, Arlington, Va. **REACTIONS OF CEREBRAL CORTEX NEURONS TO ALTERNATING MAGNETIC FIELD ON GLUTAMIC ACID Abstract Only**  
L. P. SOLDATOVA and N. A. UDINTSEV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 67-68 30 Jul. 1984 Transl. into ENGLISH from Biol. Nauki (Moscow), no. 1, Jan. 1984 p 52-54  
Avail: NTIS HC A06

The possibility of preventing or reducing morphologic damage to cerebral cortex neurons caused by exposure to magnetic fields through the administration of glutamic acid was examined. Preliminary administration of sodium glutamate to white rats was found to significantly reduce damage to cortical neurons caused by exposure to an alternating magnetic field of 20 mT in tests with five-times exposure for 6.5 hours. The male white rats received sodium glutamate subcutaneously at 1 mg per g of body mass. Pathological and morphological changes in neurons are illustrated by photomicrographs. The protective effect of the sodium glutamate is associated with its properties as a general adaptogen, as well as its ability to regulate the metabolism and status of the neuroendocrine system. Glutamic acid and its related metabolites apparently regulate energy metabolism and ion-electrolyte balance, decreasing edema and vacuolization of cortical neurons. Author

**N84-30682#** Joint Publications Research Service, Arlington, Va. **INFLUENCE OF MICROWAVE ELECTROMAGNETIC RADIATION AND CERTAIN HORMONES ON OSMOTIC RESISTANCE OF MOUSE ERYTHROCYTES Abstract Only**  
V. M. KOLDAYEV and N. A. LAZERENKO *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 68 30 Jul. 1984 Transl. into ENGLISH from Byul. Eksperim. Biol. i Med. (Moscow), no. 1, Jan. 1984 p 51-52  
Avail: NTIS HC A06

The influence of hydrocortisone, adrenalin, and corticotropin on the erythrocyte osmotic resistance of mice exposed to microwave radiation was investigated. The microwave irradiation was administered daily for 8 min for 12 days, intensity 62 + or - 5 mW/sq cm, frequency 2374 MHz. Experiments were performed on 594 white mice of both sexes. Groups of mice received adrenalin,, hydro-cortisone, or corticotropin every other day for 12

days. Erythrocyte osmotic resistance was determined on days 2, 4, 6, 8, 10, 12, and 17 of the experiments, 30 minutes after microwave irradiation or administration of the substances. No significant difference in osmotic resistance was observed between healthy and control mice, and the use of the hormones alone had no significant influence on osmotic resistance of erythrocytes in nonirradiated mice. Mice receiving radiation and isotonic NaCl solution showed an increase in T sub 50 during the first 6 days by a factor of 1.25 to 1.30. Mice receiving hydrocortisone and corticotropin showed less change in osmotic resistance, T sub 50 increasing by only 15% to 17% by day 8 of the experiment. Adrenalin had a similar influence, though weaker than that of hydrocortisone. Author

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### AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

**A84-39800\*** Stanford Univ., Calif.  
**REACTION TIMES TO WEAK TEST LIGHTS**  
B. A. WANDELL, P. AHUMADA, and D. WELSH (Stanford University, Stanford, CA) Vision Research (ISSN 0042-6989), vol. 24, no. 7, 1984, p. 647-652. refs  
(Contract NIH-2-RO1-EY-03164-04; NCC2-44)

Maloney and Wandell (1984) describe a model of the response of a single visual channel to weak test lights. The initial channel response is a linearly filtered version of the stimulus. The filter output is randomly sampled over time. Each time a sample occurs there is some probability increasing with the magnitude of the sampled response - that a discrete detection event is generated. Maloney and Wandell derive the statistics of the detection events. In this paper a test is conducted of the hypothesis that the reaction time responses to the presence of a weak test light are initiated at the first detection event. This makes it possible to extend the application of the model to lights that are slightly above threshold, but still within the linear operating range of the visual system. A parameter-free prediction of the model proposed by Maloney and Wandell for lights detected by this statistic is tested. The data are in agreement with the prediction. Author

**A84-40116**  
**FUNCTIOGENIC HYPERTROPHY OF THE HUMAN HEART ON THE MORPHOLOGICAL LEVEL [FUNKTSIOGENNAIA GIPERTOFIIA SERDTSIA CHELOVEKA V MORFOLOGICHESKOM OSVESHCHENII]**  
I. D. SHPERLING Yerevan, Izdatel'stvo Aistat, 1983, 124 p. In Russian. refs

The hypertrophic process in the human heart is investigated on the organ and cell-tissue levels. Published data and original results are examined concerning the morphological characteristics and functional evaluation of concentric and eccentric forms of ventricle hypertrophy and concerning the structural features of myocardium hypertrophy. B.J.

**A84-40120**  
**ARTERIAL HYPERTENSION (2ND REVISED AND ENLARGED EDITION) [ARTERIAL'NYE GIPERTENZII /2ND REVISED AND ENLARGED EDITION/]**  
E. E. GOGIN (Tsentral'nyi Institut Usovershenstvovaniia Vrachey, Moscow; Glavnyi Voennyi Klinicheskii Gospital', USSR), A. N. SENENKO (Voenno-Meditsinskaya Akademiia, Leningrad, USSR), and E. I. TIURIN (Ministerstvo Zdravookhraneniia SSSR, Moscow, USSR) Leningrad, Izdatel'stvo Meditsina, 1983, 272 p. In Russian. refs

Several clinical forms of arterial hypertension are investigated, and the functions of various sections of the vascular bed are described in detail. Attention is given to the role of metabolic

abnormalities and transcapillary exchange in the regulation of circulation, the rheological characteristics of the blood, rennin-angiotonic pressor and depressor systems in the kidneys, and the mineralocorticoid functions of the adrenal glands. Special emphasis is given to a detailed description of hypertonic diseases. I.H.

#### A84-40135

##### EMOTIONS AND THE PATHOLOGY OF THE HEART [EMOTSII I PATOLOGIJA SERDTSA]

E. I. SOKOLOV and E. V. BELOVA Moscow, Izdatel'stvo Nauka, 1983, 304 p. In Russian. refs

A general study is made of the psychological, physiological and biochemical characteristics of emotional stress and their relation to the pathogenesis of hypertensive illnesses. Attention is given to the role of emotions in cardiovascular disease, the electrocardiographic characteristics of emotional stress, and the different external factors which lead to the development of stress-related illness. Some distinguishing characteristics of personalities susceptible to hypertensive reactions to emotional stress are described, and the connection between intellectual activity and the activation of the sympathoadrenal system is studied in 150 healthy and 400 hypertensive subjects. Finally, the possible influence of biorhythms on hypertensive reactions to stress, and some pharmacological issues raised in the treatment of diseases caused by hypertensive reactions to emotional stress are examined. I.H.

A84-40298\* Massachusetts Inst. of Tech., Cambridge.

##### SPATIAL ORIENTATION IN WEIGHTLESSNESS AND READAPTATION TO EARTH'S GRAVITY

L. R. YOUNG, C. M. OMAN, B. K. LICHTENBERG (MIT, Cambridge, MA), D. G. D. WATT (McGill University, Montreal, Canada), and K. E. MONEY (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 205-208. Research supported by the Defence and Civil Institute of Environmental Medicine of Canada and Medical Research Council of Canada. refs

(Contract NAS9-15343)

Unusual vestibular responses to head movements in weightlessness may produce spatial orientation illusions and symptoms of space motion sickness. An integrated set of experiments was performed during Spacelab 1, as well as before and after the flight, to evaluate responses mediated by the otolith organs and semicircular canals. A variety of measurements were used, including eye movements, postural control, perception of orientation, and susceptibility to space sickness. Author

#### A84-40299

##### EFFECTS OF RECTILINEAR ACCELERATION AND OPTOKINETIC AND CALORIC STIMULATIONS IN SPACE

R. VON BAUMGARTEN, J. KASS, H. VOGEL, J. WETZIG (Mainz, Universitaet, Mainz, West Germany), A. BENSON (RAF, Institute of Aviation Medicine, Farnborough, Hants., England), A. BERTHOZ, T. VIEVILLE (CNRS, Laboratoire de Physiologie Neurosensorielle, Paris, France), TH. BRANDT, TH. PROBST (Alfred Krupp Krankenhaus, Essen, West Germany), W. BRUZEK (Tuebingen, Universitaet, Tuebingen, West Germany) et al. Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 208-212. Research sponsored by the Bundesministerium fuer Forschung und Technologie and Centre National d'Etudes Spatiales. refs

During the flight of Spacelab 1 the crew performed a number of experiments to explore changes in vestibular function and visual-vestibular interactions on exposure to microgravity. Measurements were made on the threshold for detection of linear oscillation, vestibulo-ocular reflexes elicited by angular and linear movements, oculomotor and posture responses to optokinetic stimulations, and responses to caloric stimulation. Tests were also conducted on the ground, during the 4 months before and on days 1 to 6 after flight. The most significant result was that caloric nystagmus of the same direction as on the earth could also be evoked in the weightless environment. Author

A84-40300\* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

##### VESTIBULOSPINAL REFLEXES AS A FUNCTION OF MICROGRAVITY

M. F. RESCHKE, J. L. HOMICK (NASA, Johnson Space Center, Space Biomedical Research Institute, Houston, TX), and D. J. ANDERSON (Michigan, University, Ann Arbor, MI) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 212-214. refs

Data from previous manned space flights suggest that an exposure to microgravity produces significant alterations in vestibular, neuromuscular, and related sensory system functions. It is possible that the observed changes are a function of adaptation induced by altered otolith input. An experiment in Spacelab 1 was conducted with the aim to study this adaptation as it occurred in flight and after flight, and to relate the observed changes to mechanisms underlying space motion sickness. The concept was explored by making use of the anatomic pathway which links the otolith organs and spinal motoneurons. The overall sensitivity of the spinal motoneurons was tested by two related methods. One method involves the electrical excitation of neural tissue and the recording of vestibulospinal reflexes in conjunction with a brief linear acceleration. The second method is concerned with measurements of dynamic postural ataxia. Results suggest that more than a single time constant may be involved in man's ability to return to baseline values. G.R.

A84-40301\* Illinois Univ., Urbana.

##### PROLONGED WEIGHTLESSNESS AND HUMORAL IMMUNITY

E. W. VOSS, JR. (Illinois, University, Urbana, IL) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 214, 215. refs (Contract NAS9-19328)

Preflight, inflight, and postflight serum samples obtained from crewmen aboard STS-9 were analyzed for immunoglobulin content. Control studies for circadian rhythm were conducted to further validate the analyses. Quantitation of immunoglobulins G, M, A, D, and E indicated relatively minor fluctuations in the concentration of each class of immunoglobulin during the experiment. Thus, microgravity effects on immunoglobulin levels during a 10-day flight were considered insignificant. Author

A84-40302\* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

##### INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN

C. S. LEACH and P. C. JOHNSON (NASA, Johnson Space Center, Medical Sciences Div., Houston, TX) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 216-218. refs

It has been found in connection with American and Soviet manned space missions that a reduction in the circulating red blood cell mass (RCM) is a result of the effect of space flight on the human hematological system. An experiment conducted during the 10-day Spacelab 1 mission in November 1983 was designed to measure factors involved in the control of erythrokinetics which might be altered after exposure to microgravity. In this experiment a decrement in RCM approximately equal to that observed in crewmen returning from Apollo flights of similar duration (7) was measured. Erythropoietin decreased in flight in all crew members. The lack of significant change in erythropoietin with a significant decrease in reticulocyte number and a decrease of about 1 percent per day in mean RCM suggests that inhibition of erythropoiesis is not the primary or only cause of the inflight RCM reduction. G.R.

A84-40303\* Freie Univ., Berlin (West Germany).

##### VENOUS PRESSURE IN MAN DURING WEIGHTLESSNESS

K. A. KIRSCH, L. ROECKER, O. H. GAUER, R. KRAUSE, H. J. WICKE (Berlin, Freie Universitaet, Berlin, West Germany), C. LEACH, and R. LANDRY (NASA, Johnson Space Center, Medical Science Div., Houston, TX) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 218, 219. Research supported by the Bundesministerium fuer Forschung und Technologie. refs

To determine whether the body fluid shift from the lower limbs toward the head that occurs during spaceflight leads to lasting

increases of venous pressure in the upper body, venous pressure and hematocrit measurements were made on four astronauts before flight and 1 and 12 hours after recovery and compared with measurements in space. During the mission the hematocrit was elevated and the venous pressure lowered by 1 to 8 centimeters of water as compared with the preflight data. One hour after landing the hematocrit decreased, indicating a hemodilution, venous pressures were unexpectedly high, and a body weight loss of 4 to 5 percent was observed. Twelve hours later the venous pressures were the lowest recorded during the study. The fluid shift apparently takes place during the first several hours of spaceflight. Thereafter, the pressure in the peripheral veins and the central circulation is lower than that measured before flight. Author

**A84-40304\*** Stirling Univ. (Scotland).

**MASS DISCRIMINATION DURING PROLONGED WEIGHTLESSNESS**

H. ROSS, E. BRODIE (Stirling, University, Stirling, Scotland), and A. BENSON (RAF, Institute of Aviation Medicine, Farnborough, Hants., England) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 219-221. Research supported by the Medical Research Council of England, ESA, and NASA. refs

Thresholds for mass discrimination under zero gravity in flight were found to be higher by a factor of about 1.8 than those for weight discrimination before flight. This suggests that humans are not as sensitive to inertial mass as they are to weight, and that adaptation can only partially compensate for loss of gravity. Weight discrimination thresholds were raised for 2 or 3 days after flight, suggesting an aftereffect of adaptation to weightlessness. Author

**A84-40305**

**EYE MOVEMENTS DURING SLEEP IN WEIGHTLESSNESS**

O. QUADENS (Antwerpen, Universitaire Instelling, Antwerp, Belgium) and H. GREEN (Clinical Research Center, Harrow, Middx., England) Science (ISSN 0036-8075), vol. 225, July 13, 1984, p. 221, 222. Research supported by Medical Research Council of England, Universitaire Instelling Antwerpen, and Fonds National de la Recherche Scientifique. refs

The number of eye movements during sleep increased during the first sleep period in zero gravity but returned to normal by the second night. These rapid-eye-movement functions in flight may be the first variations of an oscillatory system. The ratio of the higher and lower eye movement frequencies oscillates within normal-gravity limits. Author

**A84-40335**

**OCULAR EFFECTS OF GAAS LASERS AND NEAR INFRARED RADIATION**

W. T. HAM, JR., H. A. MUELLER, J. J. RUFFOLO, JR., R. K. GUERRY (Virginia Commonwealth University, Richmond, VA), and A. M. CLARKE Applied Optics (ISSN 0003-6935), vol. 23, July 1, 1984, p. 2181-2186. Research supported by Bell Telephone Laboratories, Inc. refs  
(Contract DAMD17-82-C-2083)

Two rhesus monkeys were exposed to CW laser irradiation of the retina at three different wavelengths from a Xe lamp and one from a GaAs laser for 1000 sec/day, five continuous days per week for several months. The trials were run to determine a minimum level of radiant exposure that would produce retinal damage, establish a threshold for the 820, 860, and 910 nm wavelengths used as an upper limit for retinal damage and to simulate the worst case conditions that could be encountered by personnel working on fiber-optic laser systems. The 50 microns diam GaAs laser beam has a power density of 293 micro-W/sq cm. The monkeys' vision was tested for acuity, spectral sensitivity, and latency of response. No loss of visionary functions was detected. Histological examination of retinal tissue indicated that 6-8.4 mW of GaAs radiation for 400-3000 sec could produce a noticeable lesion, indicating that humans would not be in danger while working on fiber-optic laser systems unless magnification optics were in use. M.S.K.

**A84-40352**

**HEMATOLOGIC AND HEMOSTATIC CHANGES WITH REPETITIVE AIR DIVING**

R. G. ECKENHOFF and J. S. HUGHES (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 592-597. Navy-supported research. refs

The effect of repeated exposure to compression at 148 ft sea water gauge (fswg) for 28 min followed by decompression (8 min at 20 fswg and 24 min at 10 fswg, with travel rate 60 ft/min) on hematological and hemostatic parameters is investigated experimentally in 14 male subjects age 20-41 on 12 consecutive days. Venous blood samples are obtained before the first exposure and 2 h after decompression on days 2, 4, 6, 8, 10, and 12 and analyzed using standard clinical techniques; venous gas emboli (VGE) are detected by precordial Doppler ultrasonic monitoring. The results are presented in tables and graphs and discussed. VGE is found in over 60 percent of the subjects, reaching a peak in 65 min and remaining detectable for 3-5 h. Significant but clinically irrelevant changes in red-cell mass and size distribution, basophilic granulocytes and atypical lymphocytes, monocyte number, immature neutrophilic granulocytes, and fibrinogen concentration are reported. These results are consistent with the finding of no decompression-sickness symptoms. T.K.

**A84-40353**

**COGNITIVE IMPAIRMENT OF ACUTE MOUNTAIN SICKNESS AND ACETAZOLAMIDE**

A. J. WHITE (Royal South Hants Hospital, Southampton, England) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 598-603. refs

The effect of ascent from sea level to 3600 m in 36 h on physical well being and cognitive performance is evaluated in six men and five women (five sex-matched pairs) taking either 500 mg/d of 8-h-half-life acetazolamide (A) or a placebo (on a double-blind basis) for 5 d beginning 2 d before ascent. An environmental symptom questionnaire (ESQ), a trail-making test, a paced auditory serial-addition test (PASAT), a dual-task cancellation and subtraction test, and a memory test are administered before ascent, 12 h after ascent, and 15-20 d after ascent, and a control trial is performed at 800 m; the results are presented in tables. The physical symptoms of benign acute mountain sickness (AMS) are improved by A, as indicated in the ESQ-score deterioration (62 points with placebo vs. 32 points with A;  $p = 0.055$ ). The only significant cognitive impairment on ascent is found in the PASATs and the memory tests of subjects taking placebo, indicating the prophylactic effect of A on cognitive impairment due to AMS and the clinical insignificance of the adverse effects of A. T.K.

**A84-40359**

**DRUG TREATMENT OF MOTION SICKNESS - SCOPOLAMINE ALONE AND COMBINED WITH EPHEDRINE IN REAL AND SIMULATED SITUATIONS**

O. TOKOLA, G. GOTHONI (Medica Pharmaceutical Co., Ltd., Helsinki, Finland), L. A. LAITINEN (Naval Headquarters, Helsinki, Finland), J. AHO (First Central Military Hospital, Helsinki, Finland), and H. VAPAATALO (Tampere, University, Tampere, Finland) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, July 1984, p. 636-641. refs

In two placebo-controlled, double-blind, randomized trials scopolamine (0.3 mg) alone or combined with ephedrine (25 mg) was tested for its effectiveness in the prevention of seasickness during 24 h at sea and of motion sickness in rotating chair tests in a laboratory. Scopolamine was effective both alone and in combination with ephedrine, which supports the hypothesis on central cholinergic overactivity in the pathogenesis of motion sickness. Ephedrine did not markedly increase the effectiveness of scopolamine. Side-effects were slight and did not disturb the operating ability of the volunteers. Author

A84-40564

**FOUR-KM ALTITUDE EFFECTS ON PERFORMANCE AND HEALTH**

D. D. CUDABACK (California, University, Berkeley, CA) Astronomical Society of the Pacific, Publications (ISSN 0004-6280), vol. 96, June 1984, p. 463-477. refs

The physiological and medical effects of travelling rapidly from sea level to 4 km altitude and the effects expected when living at 3 km and working at 4 km are discussed. The situation is that of astronomers who live near mountaintop observatories. Performance degrades immediately when reaching altitude and remains low for several days/weeks of acclimatization. A similarity has been noted between high-altitude duty intellectual performance and the influence of sedative drugs. Endurance is lowered by less available oxygen and may be accompanied by acute mountain sickness. Lung rates may appear, together with retinal hemorrhages, peripheral edema, headaches and insomnia, and no relation can be evidenced between onset and physical fitness. It is recommended that a 10 percent oxygen enrichment be supplied to all observatory buildings and residences to upgrade health and decrease the incidence of 'stupid' mistakes. M.S.K.

A84-40565

**HEALTH AND WORK AT HIGH ALTITUDE - A STUDY AT THE MAUNA KEA OBSERVATORIES**

P. J. G. FORSTER (Royal Liverpool Hospital, Liverpool, England) Astronomical Society of the Pacific, Publications (ISSN 0004-6280), vol. 96, June 1984, p. 478-487. Research supported by the Science and Engineering Research Council of England and Royal Observatory of Edinburgh. refs

The low oxygen environment of high altitude decreases the efficiency and poses risks to the health of personnel manning telescopes at high altitudes. In a study at the Mauna Kea observatories (4200 m) in Hawaii, symptoms of acute mountain sickness were prevalent amongst telescope staff. Memory and psychomotor ability deteriorated on initial exposure to high altitude. Altitude-sickness symptoms abated and performance improved after several days on the mountain. Individual workers reacted to the stress of hypoxia in a reproducible manner on each ascent. Episodes of potentially fatal altitude sickness (pulmonary and cerebral edema) were unexpectedly rare. Provision for immediate descent and awareness of the hazards of hypoxia are the most effective precautions to ensure safe working at high-altitude-based observatories. Author

A84-40701

**THE SIGNIFICANCE OF ULTRASONIC DOPPLEROGRAPHY IN MONITORING THE EFFICIENCY WITH WHICH STROKE SURVIVORS CAN BE TREATED WITH DECIMETER-WAVELENGTH ELECTROMAGNETIC WAVES [ZNACHENIE UL'TRAZVUKOVOI DOPPLEROGRAFI I V KONTROLE ZA EFFEKTIVNOST' I U LECHENIIA ELEKTROMAGNITNYMI VOLNAMI DETSIMETROVOGO DIAPAZONA BOL'NYKH, PERENESSHIKH MOZGOVOI INSULT]**

N. I. STRELKOVA, I. U. T. PONOMAREV, D. P. DANILOVA, E. N. STRELTSOVA, and T. V. NUSHTAEVA (Tsentr al'nyi Nauchno-Issledovatel'skii Institut Kurortologii i Fizioterapii, Moscow, USSR) Zhurnal Nevropatologii i Psikhiiatrii im. S. S. Korsakova (ISSN 0044-4588), vol. 84, 1984, p. 43-47. In Russian. refs

A84-40702

**CEREBRAL HEMODYNAMICS IN THE EARLY RECOVERY PERIOD AFTER RECONSTRUCTIVE OPERATIONS ON CEREBRAL VESSELS UNDER THE EFFECT OF DECIMETER-WAVE THERAPY [TSEREBRAL'NAIA GEMODINAMIKA V RANNEM VOSSTANOVITEL'NOM PERIODE POSLE REKONSTRUKTIVNYKH OPERATSII NA SOSUDAKH GOLOVNOGO MOZGA POD VLIIANIEM DETSIMETROVOLNOVOI TERAPII]**

D. P. DANILOVA (Tsentr al'nyi Nauchno-Issledovatel'skii Institut Kurortologii i Fizioterapii, Moscow, USSR) Zhurnal Nevropatologii i Psikhiiatrii im. S. S. Korsakova (ISSN 0044-4588), vol. 84, 1984, p. 50-55. In Russian.

A84-40704

**UTILIZATION OF RESULTS OF ANALYSES OF WORK CONDITIONS AND HEALTH OF RAIL-TRANSPORT TRAFFIC CONTROLLERS IN THE PLANNING OF HEALTH MEASURES [ISPOL'ZOVANIE REZUL'TATOV ANALIZA USLOVII TRUDA I ZDOROV'IA POEZDNYKH DISPATCHEROV V PLANIROVANII OZDOROVITEL'NYKH MEROPRIIATII]**

A. A. PROKHOROV and V. A. KUDRIN (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Zheleznodorozhnoi Gigieny, Moscow, USSR) Gigiena Truda i Professional'nye Zabolevaniia, Jan. 1984, p. 10-14. In Russian. refs

A84-40705

**SUBJECTIVE FEELING OF FATIGUE IN OPERATORS DEPENDING ON AGE, LENGTH OF SERVICE, AND LEVEL OF AEROBIC WORK CAPACITY [SUB'EKTIVNOE CHUVSTVO UTOMLENIIA U OPERATOROV V ZAVISIMOSTI OT VOZRASTA, RABOCHEGO STAZHA I UROVNIA AEROBNOI RABOTOSPOSOBNOSTI]**

K. KHIZHINSKI (Institut Meditsiny Truda, Lodz, Poland) Gigiena Truda i Professional'nye Zabolevaniia, Jan. 1984, p. 14-17. In Russian. refs

Ninety-two operators at a thermal electric power plant in Lodz were divided into three groups according to age, length of service, and aerobic work capacity and were asked to answer the questionnaire of the Japanese Society of Occupational Medicine (JSOM) before and after the daytime shift. The frequencies of subjective complaints in the groups are compared, and the significance of differences is assessed by the Fisher criterion for 2 x 2 sign contingency tables. An assessment is made of the suitability of the JSOM questionnaire for the subjective evaluation of fatigue. B.J.

A84-40706

**WORK CAPACITY AND FATIGUE IN A COLOR ENVIRONMENT [RABOTOSPOSOBNOST' I UTOMLENIE V TSVETOVOM OKRUZHENII]**

N. M. BELIAEVA and I. U. S. RIABOV (Institut Stroitel'noi Fiziki, Moscow, USSR) Gigiena Truda i Professional'nye Zabolevaniia, Jan. 1984, p. 18-21. In Russian. refs

A84-40707

**COLD-ADAPTATION TRAINING AS A MEANS TO RESTORE THE FUNCTIONAL CONDITION OF THE BODY AFTER THE WORK DAY [ZANIATIE V SEKTSII AKH ZAKALIVANIIA KAK SREDSTVO VOSSTANOVLENIIA FUNKTSIONAL'NOGO SOSTOIANIIA ORGANIZMA POSLE TRUDOVOGO DNIA]**

M. A. BUTOV (Riazanskii Meditsinskii Institut, Ryazan, USSR) Gigiena Truda i Professional'nye Zabolevaniia, Jan. 1984, p. 43, 44. In Russian. refs



A84-40709

**CRITERIA OF HUMAN ADAPTATION TO COLD [KRITERII ADAPTATSII CHELOVEKA K KHOLODU]**

M. A. IAKIMENKO, T. G. SIMONOVA, T. V. KOZYREVA, and P. V. LAZARENKO (Akademiia Meditsinskikh Nauk SSSR, Novosibirsk, USSR) Gigiena i Sanitariia (ISSN 0016-9900), Jan. 1984, p. 7-9. In Russian. refs

Two groups of healthy construction workers 20-30 years of age were investigated. One group (cold-adapted) customarily worked in the open air, while the other group (nonadapted) worked in heated buildings; all the workers were from cold regions. A variety of physiological tests was conducted in standard conditions of thermal comfort and general moderate cooling in the case of steady-state heat transfer between the body and the environment. Physiological variables are established which might serve as criteria for adaptation to cold.

B.J.

A84-40711

**EVALUATION OF THE EFFICIENCY OF A SYSTEM FOR THE RADIATION PROTECTION OF MEDICAL PERSONNEL [K OTSENKE EFFEKTIVNOSTI SISTEMY RADIATIONNOI ZASHCHITY MEDITSINSKOGO PERSONALA]**

N. S. TER-KAZARIAN (Tsentral'nyi Institut Uovershenstvovaniia Vrachei, Moscow, USSR) Gigiena i Sanitariia (ISSN 0016-9900), Jan. 1984, p. 77-79. In Russian.

A84-40712

**IMMUNOLOGICAL RESISTANCE AND ADAPTIVE RESPONSES DURING COLD-ADAPTATION TRAINING [IMMUNOLOGICHESKAIA REZISTENTNOST' I ADAPTATIONNYE REAKTSII PRI ZAKALIVANII KHOLODOM]**

A. M. NOGALLER, M. A. BUTOV, and T. A. KALYGINA (Riazanskii Meditsinskii Institut, Ryazan, USSR) Sovetskaia Meditsina, no. 1, 1984, p. 92-95. In Russian. refs

A84-40714

**INTERNEURON AND NERVE-TISSUE CONNECTIONS IN THE SYMPATHETIC GANGLIA IN HUMANS [MEZHNEIRONNYYE I NEIROTKANEVYE SVIAZI V SIMPATICHESKIKH GANGLIIKHX CHELOVEKA]**

V. N. SHVALEV, A. A. SOSUNOV, K. L. MARIAN, and A. IU. ANIKIN (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Arkhiv Anatomii, Gistologii i Embriologii (ISSN 0004-1947), vol. 86, Jan. 1984, p. 50-58. In Russian. refs

Peculiar osmophilic bodies in the neuronal mitochondria were revealed by electron microscope in a study of 12 cervical-thoracic sympathetic ganglia three hours after sudden death. Successive stages in the formation of these bodies were observed. A description is given of the afferent nerve terminals adjoining the sympathetic neuron bodies but separated from them by a gap. The structure of the receptors in the ganglia is compared to that of the sympathetic contacts, and the latter are shown to be predominantly axodendritic.

B.J.

A84-40716

**GRADED VOLUME PHYSICAL EXERCISE IN THE DIAGNOSIS OF EARLY CARDIAC INSUFFICIENCY IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION [DOZIROVANNAIA OB'EMNAIA NAGRUZKA V DIAGNOSTIKE RANNEI SERDECHNOI NEDOSTATOCHNOSTI U BOL'NYKH OSTRYM INFARKTOM MIOKARDA]**

N. A. GVATUA, V. L. KRAVTSOV, V. A. SHUMAKOV, N. N. BEZIUK, and IU. V. DOVGALENKO (Kievskii Nauchno-Issledovatel'skii Institut Kardiologii, Kiev, Ukrainian SSR) Kardiologiia (ISSN 0022-9040), vol. 24, Jan. 1984, p. 18-22. In Russian. refs

A84-40717

**SUDDEN DEATH FROM ACUTE CORONARY FAILURE IN WOMEN UNDER 50 YEARS OF AGE [VNEZAPNAIA SMERT' OT OSTROI KORONARNOI NEDOSTATOCHNOSTI U ZHENSCHIN V VOZRASTE DO 50 LET]**

S. K. CHURINA (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Kardiologiia (ISSN 0022-9040), vol. 24, Jan. 1984, p. 41-45. In Russian. refs

A84-40718

**APPLICATION OF TESTING WITH GRADED PHYSICAL EXERCISE IN THE EARLY PERIOD AFTER ACUTE MYOCARDIAL INFARCTION [PRIMENENIE PROBY S DOZIROVANNOI FIZICHESKOI NAGRUZKOI V RANNIE SROKI POSLE OSTROGO INFARKTA MIOKARDA]**

R. T. BOKEBAEVA (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Kardiologiia (ISSN 0022-9040), vol. 24, Jan. 1984, p. 45-48. In Russian. refs

A84-40721

**AGE-SEX DIFFERENCES IN THE CHARACTERISTICS OF NEUROHUMORAL SHIFTS IN PATIENTS WITH MYOCARDIAL INFARCTION [VOZRASTNO-POLOVYE RAZLICHIIA V OSOBNOSTIAX NEIROGUMORAL'NYKH SDVIGOV U BOL'NYKH INFARKTOM MIOKARDA]**

L. V. SHPAK (Kalininskii Meditsinskii Institut, Kalinin, USSR) Kardiologiia (ISSN 0022-9040), vol. 24, Jan. 1984, p. 88-91. In Russian. refs

A84-40900

**EFFECT OF VOYAGE CONDITIONS AND PHYSICAL EXERCISE ON THE HEALTH AND WORK CAPACITY OF SEAMEN [O VLIIANII USLOVII PLAVANIIA I FIZICHESKIKH UPRAZHNIENII NA ZDOROV'E I RABOTOSPOSOBNOST' MORIAKOV]**

V. M. KOROVAEV (Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1984, p. 48, 49. In Russian.

A84-41227

**PRESBYOPIA AND PILOTING - WHICH CORRECTION TO CHOOSE? [PRESBYTIE ET PILOTAGE - QUELLE CORRECTION CHOISIR?]**

J. A. GRAVELINE (Centre d'Examen Medical du Personnel Navigant, Journee Regionale de Medecine Aeronautique Clinique, Marseille, France, Sept. 30, 1983) Medecine Aeronautique et Spatiale, vol. 23, 2nd Quarter, 1984, p. 119-121. In French.

The physiological causes and effects and the corrective lenses available for ameliorating presbyopia (far-sightedness) in older pilots are surveyed. The condition arises with age as a result of a loss of elasticity in the lens, which lessens the eyes' ability to accommodate the nearness of objects. Convex lenses can be configured to offset the loss of accommodation. Unifocal lens glasses are, however, not permitted for pilots, who need both near and far vision, peripherally, up and down and ahead. The ingestion of alcohol or tranquilizers and hypoxia at over 4500 m altitude aggravate the slowness of accommodation. The use of progressive lenses, i.e., those which gradually change foci or half-lenses are recommended for pilots and navigators in order to be declared fit for flight.

M.S.K.

A84-41228

**THE MOST FREQUENCY OTO-RHINO-LARYNGOLOGICAL CAUSES OF FITNESS RESTRICTION [LES CAUSES DE RESTRICTION D'APTITUDE LES PLUS FREQUENTES EN OTO-RHINO-LARYNGOLOGIE]**

A. E. DUPERRET (Centre d'Examen Medical du Personnel Navigant, Journee Regionale de Medecine Aeronautique Clinique, Marseille, France, Sept. 30, 1983) Medecine Aeronautique et Spatiale, vol. 23, 2nd Quarter, 1984, p. 122-124. In French.

The norms for hearing and dental health accepted by flight surgeons in judging the flight fitness of pilots are examined. Civil pilots are usually evaluated according to military standards. Dentures are not allowed and the teeth and all dental work must align properly. X-rays are needed to verify that no piece of dental

work will be torn loose and possibly puncture the esophagus or choke the pilot during an abrupt deceleration. Hearing must be sufficient to perceive a hushed voice at about 6 m. Military and civil standards differ for auditory acuity. The military permits up to 30 dB loss in continuous tonal perception from 6-8000 Hz. Civil pilots are required to hear from 250-3000 Hz and hearing loss must be 20 dB or less at any frequency. It is noted that medical treatment is available for a wide variety of hearing disorders.

M.S.K.

#### A84-41229

##### **HUMAN FACTORS IN THE MIRAGE 2000 [LES FACTEURS HUMAINS DANS LE MIRAGE 2000]**

H. VIELLEFOND (Service de Sante des Armees, Paris; Centre d'Essais en Vol, Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge, Essonne, France) (Journée de Medecine Aeronautique de la Force Aerienne Tactique, Metz, France, Nov. 4, 1983) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 132-137. In French.

It is shown that technical advances in ergonomic design have compensated for many performance enhancements built into the Mirage 2000, while problems persevere in the form of high acceleration rates and pilot workload. The accelerations produce deformations in the soft parts of the body, tachycardia, ECG irregularities, sinusoidal arrhythmia, bradyarrhythmia, edema in the feet, etc. Tolerance is a function of the intensity of the acceleration and physical condition of the pilot and his environment. Forced abdominally-controlled breathing alleviates some of the distress but is fatiguing to the pilot. Fewer motions are necessary to control the aircraft due to digitized controls, although the mental workload may not be reduced. Finally, altitude problems have been ameliorated with a pressurized cabin, respirator and anti-g suit to furnish pressure in hypobaric conditions.

M.S.K.

#### A84-41230

##### **CARDIOVASCULAR TOLERANCE TO SUSTAINED AND HIGH INTENSITY POSITIVE G ACCELERATIONS - GENERAL REVIEW [TOLERANCE CARDIO-VASCULAIRE AUX ACCELERATIONS +GZ SOUTENUES ET DE HAUTE INTENSITE- REVUE GENERALE]**

G. LEGUAY and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (Journée de Medecine Aeronautique de la Force Aerienne Tactique, Metz, France, Nov. 4, 1983) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 137-141; 143-156. In French. refs

New military aircraft can expose pilots to 6 g accelerations lasting up to 15 sec, as well as 1 g/sec acceleration. Problems are present in the form of the pilot's hemodynamic, myocardial and rhythmic tolerance to the physiological loads. Protective measures include the anti-g suit, M1, M2 and L1 forced breathing/muscular contraction movements, positive pressure breathing and tilt-back seats. The high-g forces can, however, cause loss of consciousness, lesions in the aortic muscles and the myocardial fibers and myocardial ischemia. An improvement in pilot selection procedures is recommended in order to find individuals with the motivation to withstand and survive the expanded performance envelopes of modern military aircraft such as the F-16 and the Mirage 2000.

M.S.K.

#### A84-41232

##### **THE MIRAGE 2000 AND CERVICAL VERTEBRAE [MIRAGE 2000 ET RACHIS CERVICAL]**

P. J. METGES (Ecole d'Application, Service de Sante pour l'Armee de l'Air, Paris; Hopital d'Instruction des Armees Begin, Saint-Mande, Val-de-Marne, France), J. FLAGEAT, and J. L. VICENS (Hopitaux des Armees, Clamart, Hauts-de-Seine, France) (Journée de Medecine Aeronautique de la Force Aerienne Tactique, Metz, France, Nov. 4, 1983) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 162-164. In French.

The cervical section of the spinal column is a fragile structure which furnishes mobility to the head and thereby the visual field. A Mirage 2000 fighter is capable of making the head effectively weigh almost 60 kg during high-g accelerations, presenting the

danger of a cervical hernia. Thorough clinical inspection in both static and dynamic conditions can identify pilot candidates who have enhanced cervical muscle strength. Efforts must then be expanded by the pilots to harmoniously develop all spinal muscles to avoid imbalances in the muscle structure.

M.S.K.

#### A84-41237

##### **CHRONICLE OF AERONAUTICAL MEDICINE. I - PROBLEMS LINKED TO SCHEDULE CHANGES FOR FLYING PERSONNEL [CHRONIQUE DE MEDECINE AERONAUTIQUE. I - LES PROBLEMES LIES AUX DECALAGES HORAIRES CHEZ LE PERSONNEL NAVIGANT]**

M. S. MARTINOT and R. ANGIBOUST (Centre de Recherche de Medecine Aeronautique, Paris, France) *Medecine Aeronautique et Spatiale*, vol. 23, 2nd Quarter, 1984, p. 190-198. In French.

The effects of disruptions in the circadian rhythms of flying personnel because of long-distance flights are examined. Questionnaire studies have revealed that 78 percent of pilots have trouble sleeping after a flight of 4-5 hr and eating patterns become irregular. The circadian rhythm, ECG, core temperatures and endocrine rhythms of long distance pilots were studied by 6 hr flight simulator trials. Circadian shifts produced shifts in peak and low performance hours for all indicators measured. The direction of the flight affected the length of time needed for resynchronization, with eastern-directed flights being followed by the shortest readaptation periods. Readjustment after a westward flight took 0-6 days.

M.S.K.

**A84-41248\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

##### **EFFECT OF MILD ATHEROSCLEROSIS ON FLOW RESISTANCE IN A CORONARY ARTERY CASTING OF MAN**

L. H. BACK, Y. I. CHO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA), D. W. CRAWFORD (Southern California, University, Los Angeles, CA), and R. F. CUFFEL (Walla Walla College, College Place, WA) *ASME, Transactions, Journal of Biomechanical Engineering*, vol. 106, Feb. 1984, p. 48-53. refs

(Contract NAS7-100)

An in-vitro flow study was conducted in a mildly atherosclerotic main coronary artery casting of man using sugar-water solutions simulating blood viscosity. Steady flow results indicated substantial increases in pressure drop, and thus flow resistance at the same Reynolds number, above those for Poiseuille flow by 30 to 100 percent in the physiological Reynolds number range from about 100 to 400. Time-averaged pulsatile flow data showed additional 5 percent increases in flow resistance above the steady flow results. Both pulsatile and steady flow data from the casting were found to be nearly equal to those from a straight, axisymmetric model of the casting up to a Reynolds number of about 200, above which the flow resistance of the casting became gradually larger than the corresponding values from the axisymmetric model.

Author

#### A84-41538

##### **DISTINCTIVE ASPECTS OF SLIGHT SACCADIC EYE MOVEMENTS IN PATIENTS WITH ENDOCRINE MYOPATHIES [OSOBENOSTI MALYKH SAKKADICHESKIKH DVIZHENII GLAZ U BOL'NYKH S ENDOKRINNYMI MIOPATIAMI]**

A. F. BROVKINA, A. M. TIUTIUNNIKOVA, and T. P. NAUMOVA (Gosudarstvennyi Nauchno-Issledovatel'skii Institut Glaznykh Bolesnei, Moscow, USSR) *Vestnik Oftal'mologii* (ISSN 0042-465X), Jan.-Feb. 1984, p. 44-47. In Russian.

A84-41540

**DISTINCTIVE FEATURES OF THE CENTRAL HEMODYNAMICS OF PATIENTS WITH ISCHEMIC DISORDERS OF CEREBRAL CIRCULATION [OSOBENNOSTI TSENTRAL'NOI GEMODINAMIKI U BOL'NYKH S ISHEMICHESKIMI NARUSHENIAMI MOZGOVOGO KROVOOBRASHCHENIIA]**

A. P. GALAT (Leningradskii Nauchno-Issledovatel'skii Neirokhirurgicheskii Institut, Leningrad, USSR) Voprosy Neirokhirurgii (ISSN 0042-8817), Jan.-Feb. 1984, p. 5-10. In Russian. refs

A84-41541

**THE INFLUENCE OF PHYSICAL THERAPY ON THE GENERAL PHYSICAL CONDITION OF WOMEN WITH INCONTINENCE AS A RESULT OF STRESS [VLIANIE LECHEBNOI FIZKUL'TURY NA OBSHCHEE FIZICHESKOE SOSTOIANIE ZHENSCHIN S NEDERZHANIEM MOCHI PRI NAPRIAZHENII]**

F. A. IUNUSOV (Moskovskii Meditsinskii Stomato-Logicheskii Institut, Moscow, USSR) Voprosy Kurortologii, Fizioterapii i Lechebnoi Fizicheskoi Kul'tury (ISSN 0042-8787), Jan.-Feb. 1984, p. 50. In Russian.

A84-41542

**CLINICOBIOLOGICAL ASPECTS OF THE EFFECT OF THE MAGNETIC FIELD ON CHRONIC VENOUS INSUFFICIENCY [KLINIKO-BIOLOGICHESKIE ASPEKTY DEISTVIA MAGNITNOGO POLIA PRI KHRONICHESKOI VENOZNOI NEDOSTATOCHNOSTI]**

B. N. ZHUKOV, L. A. TRUFANOV, S. M. MUSIENKO, E. M. RAGIMOV, and V. A. OLEINIKOV (Kuibyshevskii Meditsinskii Institut, Kuibyshev, USSR) Voprosy Kurortologii, Fizioterapii i Lechebnoi Fizicheskoi Kul'tury (ISSN 0042-8787), Jan.-Feb. 1984, p. 27-30. In Russian.

Problems are discussed concerning the biological effects of the magnetic field on the microvascular bed and on the body as a whole in patients with chronic venous insufficiency. Compensating reactions of the vascular system under conditions of disturbed regional circulation are described. Data are reported on the pathophysiology and therapeutic effects of the magnetic field on edemic forms of post-thrombophlebitic disease. A principle based on changes in the histohematic permeability of the microvascular bed was used for determining the doses of radiation from the static magnetic field (SMF) induced by photopigmentometry. The relation between the optical properties of the skin and the state of microvascular permeability is found to be an inversely proportional relation. The therapeutic effects of low-induction static magnetic fields are determined. I.H.

A84-41544

**COMPARATIVE STUDY OF ALPHA-GLUCOSIDASE ACTIVITY IN THE LYMPHOCYTES AND GRANULOCYTES OF HUMAN PERIPHERAL BLOOD [SRVNIENIE ALFA-GLIKOZIDAZNOI AKTIVNOSTI LIMFOTSITOV I GRANULOTSITOV PERIFERICHESKOI KROVI CHELOVEKA]**

M. E. PREOBRAZHENSKAIA and A. L. MINAKOVA (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) Voprosy Meditsinskoi Khimii (ISSN 0042-8809), vol. 30, Jan.-Feb. 1984, p. 77-82. In Russian. refs

A84-41547

**FURTHER STUDY OF THE ROLE OF VITAMIN A IN IMMUNOLOGICAL REACTIONS (AS OBSERVED IN VOLUNTEERS) [DAL'NEISHEE IZUCHENIE ROLI VITAMINA A V IMMUNOLOGICHESKIKH REAKTSIIAKH /NABLIUDENIIA NA DOBROVOL'TSAKH/]**

K. D. PLETITSYI, S. B. VASIPA, V. G. SHILINSH, and T. V. DAVYDOVA (Akademiia Meditsinskikh Nauk SSSR, Moscow; Rzhskii Meditsinskii Institut, Riga, Latvian SSR) Voprosy Pitaniia (ISSN 0042-8833), Jan.-Feb. 1984, p. 26-29. In Russian. refs

Studies of volunteers receiving vitamin A for one week demonstrate that the content of peripheral blood lymphocytes increases, followed by a relative and absolute increase in the content of B lymphocytes and a rise in the number of T cells in

the peripheral blood. Increases in the complementary activity of blood serum and in the IgA levels of peripheral blood were also recorded. I.H.

A84-41548

**CLINICAL AND INSTRUMENTAL STUDIES OF THE DIGESTIVE APPARATUS WHILE USING A THERAPEUTIC DIET OF CULINARY PRODUCTS PREPARED IN MICROWAVE OVENS [KLINIKO-INSTRUMENTAL'NYE ISSLEDOVANIIA PISHCHEVARITEL'NOGO APPARATA PRI ISPOL'ZOVANII V LECHEBNOM PITANII KULINARNYKH IZDELII, PRIGOTOVLENNYKH V SVCH-PECHAKH]**

M. E. KVITNITSKII, I. A. SHLYKOV, A. V. IULIN, and I. I. TARASENKO (Kievskii Torgovo-Ekonomicheskii Institut, Kiev, Ukrainian SSR) Voprosy Pitaniia (ISSN 0042-8833), Jan.-Feb. 1984, p. 18-21. In Russian. refs

A84-41549

**CENTRAL REGULATION OF VISUAL AND SENSORY INPUT IN HEALTH AND SCHIZOPHRENIC PERSONS [TSENTRAL'NAIA REGULIATSIIA ZRITEL'NOGO SENSORNOGO VKHODA V NORME I PRI SHIZOFRENI]**

V. L. TATKO (Vsesoiuznii Nauchno-Issledovatel'skii Institut Obshchei i Sudebnoi Psikiatrii, Moscow, USSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 128-132. In Russian. refs

A study is presented of the psychophysical and electrophysical indices of perception during a signal detection task in healthy and schizophrenic persons. Stimuli control, data acquisition and analysis were performed on a MITRA-225 computer and for classification of evoked potentials (EPs) in accordance with behavioral outcomes, use was made of routine amplitude-temporal characteristics, EP component front slopes and squares of EP component values. Experimental results indicate the existence of central regulation of the afferent flow in visual pathways. With healthy persons, regulation activity was most pronounced in the regions 60-95 ms and 240-300 ms. With schizophrenic persons, disturbances were found in the regulation system and in variations of the stereotype of stimuli assimilation. I.H.

A84-41553

**THE EFFECT OF ADAPTATION LEVEL ON THE BRIGHTNESS RATING SCALE [VLIANIE UROVNIA ADAPTATSII NA RANGOVUII SHKALU IARKOSTEI]**

K. N. NADIROVA and A. N. SOKOLOV (Akademiia Nauk SSSR, Institut Psikhologii, USSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 71-73. In Russian.

The rating scale of light stimuli was analyzed in relation to three levels of light adaptation for two subjects (18 and 20 years of age) with normal vision and familiar with the aims of the experiment. The scale was found to shift and to change its form. The latter effect can be explained by errors in a central tendency involving the overestimation of dim stimuli for a low adaptation level and the underestimation of bright stimuli for a high adaptation level. B.J.

A84-41564

**THE FORCE OF ISOMETRIC TWITCH CONTRACTION AND PHASES OF TETANUS [SILA ODINOCHNOGO IZOMETRICHESKOGO SOKRASHCHENIIA I FAZY ZUBCHATOGO TETANUSA]**

V. S. GURFINKEL, I. U. S. LEVIK, and E. B. TSAREVA (Akademiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 29, Jan.-Feb. 1984, p. 139-142. In Russian. refs

A84-41566

**THE WAVELIKE NATURE OF TIME-JOINT ANGLE TRAJECTORIES IN HUMANS [O VOLNOVOI PRIRODE TSENTRAL'NOGO PROTSESSA FORMIROVANIYA TRAEKTORII IZMENENIYA SUSTAVNOGO UGLA U CHELOVEKA]**

S. V. ADAMOVICH, N. I. BURLACHKOVA, and A. G. FELDMAN (Akademiya Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 29, Jan.-Feb. 1984, p. 122-125. In Russian. refs

It is proposed that the coordinated muscle control of individual joints is determined by wave-propagating excitation along a central line-ordered group of neurons. To verify this model, human time-angle trajectories of rapid arm movements in different horizontal positions are analyzed. Different types of trajectories are identified, having the following characteristics: the initial profiles of the trajectories of one group are identical; the time duration of any two identical trajectories increases with the extent of the trajectories; and summation of two groups of trajectories with a time delay results in a trajectory of the same group. It is concluded that the data agree adequately with the model. I.H.

A84-41569

**DYNAMICS OF THE FIELD OF VISION UNDER CONDITIONS OF A STABILIZED IMAGE [DINAMIKA VELICHINY POLIA ZRENIYA V USLOVIYAKH STABILIZATSII IZOBRAZHENIYA]**

V. I. KAPRAN (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Voprosy Psikhologii (ISSN 0042-8841), Jan.-Feb. 1984, p. 101-104. In Russian. refs

It is proposed that, by specific coordination of eye muscles, particular parts of a stabilized stimulus occur in the center of vision and can be separated by the observer into particular fragments of the whole picture. The term 'functional fovea' is suggested as a name for the mechanism, and several general characteristics of the mechanism are discussed. The size of the fragments of the original image is accepted as the measure of the functional field of foveal perception. The fragments are small during the recognition task and become larger when the observer is recognizing known images. In many types of tasks, fragments become larger when the observed images are larger, but the size of the images has an upper limit and is found to be independent of the type of task or the structural features of the image. I.H.

A84-41572

**THE EFFECT OF PHYSICAL EXERCISE ON THE HEMODYNAMICS OF PATIENTS WITH CHRONIC BRONCHITIS AND BRONCHIAL ASTHMA WITH SYSTEMIC ARTERIAL HYPERTENSION [VLIYANIE FIZICHESKOI NAGRUZKI NA GEMODINAMIKU BOL'NYKH KHRONICHESKIM BRONKHITOM I BRONKHIAL'NOI ASTMOI S SISTEMNOI ARTERIAL'NOI GIPERTENSIEI]**

N. I. EGURNOV and A. A. VIZEL (Ministerstvo Zdravookhraneniya PSFSR, Vsesoiuznyi Nauchno-Issledovatel'skii Institut Pul'monologii, Leningrad, USSR) Kazanskii Meditsinskii Zhurnal, vol. 65, Jan.-Feb. 1984, p. 17-19. In Russian. refs

A84-41573

**CORRELATION OF BIOLOGICAL MACRORHYTHMS WITH THE AGGRAVATION OF LUMBAR OSTEOCHONDROSIS AND ACUTE DISTURBANCES IN BLOOD CIRCULATION IN THE BRAIN [SOOTNOSHENIE BIOLOGICHESKIKH MAKROTRIMOV S OBOSTRENIAMI POIASNICHNOGO OSTEOKHONDROZA I OSTRYMI NARUSHENIAMI MOZGOVOGO KROVOOBRAZHCENIYA]**

F. A. IAKHIN, P. A. EFIMOV, and F. F. IAKHINA (Kazanskii Meditsinskii Institut, Kazan, USSR) Kazanskii Meditsinskii Zhurnal, vol. 65, Jan.-Feb. 1984, p. 49-52. In Russian. refs

A84-42251#

**A REVIEW OF NUMERICAL MODELS FOR PREDICTING THE ENERGY DEPOSITION AND RESULTANT THERMAL RESPONSE OF HUMANS EXPOSED TO ELECTROMAGNETIC FIELDS**

R. J. SPIEGEL (U.S. Environmental Protection Agency, Health Effects Research Laboratory, Research Triangle Park, NC) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 730-746. refs

A84-42252

**LIMITATIONS OF THE CUBICAL BLOCK MODEL OF MAN IN CALCULATING SAR DISTRIBUTIONS**

H. MASSOUDI, C. H. DURNEY, and M. F. ISKANDER (Utah, University, Salt Lake City, UT) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 746-752. refs

(Contract F33615-79-C-0614)

Block models of man which consist of a limited number of cubical cells are commonly used to predict the internal electromagnetic (EM) fields and specific absorption rate (SAR) distributions inside the human body. Numerical results, for these models, are obtained based on moment-method solutions of the electric-field integral equation (EFIE) with a pulse function being used as the basis for expanding the unknown internal field. In this paper, the adequacy of the moment-method procedure, with pulse basis functions, is examined to determine SAR distributions in homogeneous models. Calculated results for the SAR distributions in some block models are presented, and the stability of the solutions is discussed. It is shown that, while the moment-method, using pulse basis functions, gives good values for whole-body average SAR, the convergence of the solutions for SAR distributions is questionable. A new technique for improving the spatial resolution of SAR distribution calculations using a different EFIE and Galerkin's method with linear basis functions and polyhedral mathematical cells is also described. Author

A84-42254

**HUMAN BODY IMPEDANCE FOR ELECTROMAGNETIC HAZARD ANALYSIS IN THE VLF TO MF BAND**

H. KANAI, I. CHATTERJEE (Utah, University, Salt Lake City, UT), and O. P. GANDHI IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 763-772. refs

(Contract F33615-83-R-0613)

A knowledge of the average electrical impedance of the human body is essential for the analysis of electromagnetic hazards in the VLF to MF band. The purpose of the measurements was to determine the average body impedance of several human subjects as a function of frequency. Measurements were carried out with the subjects standing barefoot on a ground plane and touching various metal electrodes with the hand or index finger. The measured impedance includes the electrode polarization and skin impedances, spread impedance near the electrode, body impedance, stray capacitance between the body surface and ground, and inductance due to the body and grounding strap. These components are separated and simplified equivalent circuits are presented for body impedance of humans exposed to free-space electromagnetic waves as well as in contact with large ungrounded metallic objects therein. Author

A84-42255

**EFFECT OF SEPARATION FROM GROUND ON HUMAN WHOLE-BODY RF ABSORPTION RATES**

D. A. HILL (Defence Research Establishment, Ottawa, Canada) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 772-778. refs

Whole-body absorption rates of human volunteers exposed in E-polarization are reported as a function of the separation between the subject's feet and the ground plane. Little difference is observed between the results for the EKH and EHK orientations. At frequencies below the grounded resonance (7 to 25 MHz), an air gap of 3 to 6 mm reduces the absorption rate to half the grounded rate. On the other hand, near the grounded resonance (at 40.68

MHz), an air gap of 50 to 80 mm is required for the same effect. Typical footwear provides some radiation protection by reducing the RF absorption rate by approximately 50 percent at below-resonance frequencies, or 20 percent at near-resonance frequencies. Experiments with different dielectric materials between the soles of the feet and the ground plane support the idea that those two surfaces effectively form a parallel-plate capacitor. The experimental results are compared to the predictions of the cylinder and block-model calculations. Author

**A84-42256**

### **SPECIFIC ABSORPTION RATE DISTRIBUTION IN A FULL-SCALE MODEL OF MAN AT 350 MHZ**

A. KRASZEWSKI, S. S. STUCHLY, G. HARTSGROVE, D. ADAMSKI (Ottawa, University, Ottawa, Canada), and M. A. STUCHLY (Department of National Health and Welfare, Radiation Protection Bureau, Ottawa, Canada) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 779-783. Research supported by the U.S. Navy, Department of National Health and Welfare of Canada, and Natural Sciences and Engineering Research Council of Canada. refs

**A84-42257**

### **EXPOSURE OF HUMAN MONONUCLEAR LEUKOCYTES TO MICROWAVE ENERGY PULSE MODULATED AT 16 OR 60 HZ**

N. J. ROBERTS, JR., S. M. MICHAELSON, and S.-T. LU (Rochester, University, Rochester, NY) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 803-807. refs  
(Contract F33615-83-K-0609)

Human mononuclear leukocytes were exposed to 2450-MHz microwaves pulse modulated at 16 or 60 Hz, at specific absorption rates up to 4 mW/ml. Such exposure produced no detectable effects on leukocyte viability, or on unstimulated or mitogen-stimulated DNA synthesis or total protein synthesis. The data provided no evidence that exposure to pulse-modulated microwaves is more likely to alter human leukocyte function than is exposure to continuous waves at equivalent energy levels.

Author

**A84-42258**

### **EFFECTS OF 2450-MHZ MICROWAVE ENERGY ON THE BLOOD-BRAIN BARRIER - AN OVERVIEW AND CRITIQUE OF PAST AND PRESENT RESEARCH**

W. M. WILLIAMS, S.-T. LU, M. DEL CERRO, W. HOSS, and S. M. MICHAELSON (Rochester, University, Rochester, NY) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-32, Aug. 1984, p. 808-818. refs  
(Contract NIH-5-T01-GM-01782-10; DE-AC02-76EV-03490)

Experimental studies of the ability of 2450-MHz pulsed or CW microwaves to break down the blood-brain barrier (BBB) in animals are critically reviewed. The physiology of the BBB is discussed, and the experimental findings are summarized. The results of many experiments are found to be inconclusive because of such factors as a lack of physiological confirmation of morphological findings (or vice versa), the use of anesthetics, and stressful conditions in unanesthetized animals. These methodological considerations, the factors which influence brain temperature, and the temperature effects on endocytic processes, membranes, and membrane-mediated reactions are examined in detail. Recent carefully controlled studies by Williams et al. (1984) comparing ambient-temperature-induced and CW-microwave induced 42-C-hyperthermia effects in conscious unrestrained rats show no increased BBB permeability, but do not rule out such increases (due to overt thermal injury of the microvessel endothelium) at higher temperatures. Evidence for a thermal suppression of BBB permeability has also been obtained in these experiments. T.K.

**N84-28826#** Joint Publications Research Service, Arlington, Va. **MEDICAL RESEARCH PROGRAM OF 'SOYUZ T-10' CREW**

In its USSR Rept.: Space (JPRS-USP-84-003) p 8-9 14 Jun. 1984 Transl. into ENGLISH from Med. Gaz. (USSR), 10 Feb. 1984 p 1

Avail: NTIS HC A07

The tasks to be performed by the physician aboard the Soyuz T-10 spacecraft were summarized. Among the subjects to be studied were: (1) the effect of weightlessness on the human body, (2) hemodynamics, (3) motion sickness, (4) blood electrolytes and mineral metabolism, (5) eye movements, (6) autonomic responses during optokinetic and vestibular stimulation, (7) blood supply to the eye, and (8) prophylactic training. R.S.F.

**N84-28827#** Joint Publications Research Service, Arlington, Va. **GOALS OF COSMONAUT AT'KOV'S MEDICAL STUDIES ON 'SALYUT-7'**

A. IVAKHNOV In its USSR Rept.: Space (JPRS-USP-84-003) p 10-12 14 Jun. 1984 Transl. into ENGLISH from Izvestiya (USSR), 3 Mar. 1984 p 3

Avail: NTIS HC A07

The role of the physician on the Salyut-7 space station was summarized. The medical tasks included work on the following topics: (1) motion sickness, (2) weightlessness, (3) metabolism and the growth of blood cells, (4) the cardiovascular system, (5) blood composition, (6) bone metabolism, (7) hygiene, and (8) physical exercise. R.S.F.

**N84-28832#** Joint Publications Research Service, Arlington, Va. **COMET STUDIES, MEDICAL RESEARCH ON 'SALYUT-7'**

A. POKROVSKIY In its USSR Rept.: Space (JPRS-USP-84-003) p 26-27 14 Jun. 1984 Transl. into ENGLISH from Pravda (USSR), 27 Feb. 1984 p 8

Avail: NTIS HC A07

The Crommelin comet was photographed using a supersensitive French drive called Piramig. These photographs permit specialists more accurately to determine the levels of light intensity and other natural conditions during work with Halley's comet. Medical research was also carried out on this mission. B.G.

**N84-29440\*** National Aeronautics and Space Administration, Washington, D. C.

### **AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 260)**

Jul. 1984 75 p

(NASA-SP-7011(260); NAS 1.21:7011(260)) Avail: NTIS HC \$7.00 CSDL 06E

A bibliography containing 225 reports, articles, and other documents which were introduced into the NASA Scientific and Technical Information system in June 1984 is presented. All articles are indexed and abstracted. General topics include: life sciences, aerospace medicine, behavioral sciences, man/system technology and life support, and planetary biology. R.S.F.

**N84-29441#** Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.

### **USE OF THE DOPPLER ULTRASOUND METHOD TO EVALUATE THE RATE OF BLOOD FLOW IN CHILDREN WITH PATENT DUCTUS ARTERIOSUS [ZASTOSOWANIE ULTRADZWIEKOWEJ METODY DOPPLEROWSKIEJ DO OCENY PRĘDKOŚCI PRZEPŁYWU KRWI U DZIECI Z PRZECIEKIEM AORTALNO-PLUCNYM]**

K. IWASKIEWICZ 1982 103 p refs In POLISH (ISSN-0208-5658) Avail: Issuing Activity

The Doppler ultrasound technique was used to evaluate changes in the rate of blood flow in children with patent ductus arteriosus. A group of healthy control children was used for comparison. Characteristic changes in blood flow through the carotid, humeral, and femoral arteries were established for the affected children. The usual pattern was a three-phase flow during the contraction phase and a decrease in blood flow mainly in the carotid artery. Following corrective surgery, the three-phase flow pattern ceased and there was an increase in mean blood flow

through the common carotid artery. The contraction phase also became shorter. Similar changes in the blood flow curve were observed in children with tetralogy of Fallot, in whom the subclavian artery was joined with the pulmonary artery using the Blalock-Taussig method. Doppler ultrasound results were consistent with cardiologic, radiologic, and sphygmo-oscillometric findings and also showed a high level of sensitivity in cases of shunt from the aorta to the pulmonary artery, which improved postsurgical evaluation. It is concluded that the Doppler ultrasound technique is a simple and noninvasive method for diagnosing patent ductus arteriosus. M.G.

**N84-29442#** Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.

**EXPERIMENTAL AND CLINICAL RESEARCH ON THE EFFECTIVENESS OF ULTRASOUND IN VASCULAR SURGERY [BADANIA DOSWIADCZALNE I KLINICZNE NAD PRZYDATNOSCIA ULTRADZWIEKOW W CHIRURGII NACZNIOWEJ]**

J. WESOLOWSKI 1982 212 p refs In POLISH (ISSN-0208-5658) Avail: Issuing Activity

The effectiveness of ultrasound in diagnosing occlusion of the aorta and peripheral arteries, early complications following reconstruction of the peripheral arteries, aneurysms of the aorta and peripheral arteries, and late complications following reconstruction of the abdominal aorta and peripheral arteries was assessed. In experimental studies of the canine aorta, it was shown that the most sensitive method for determining blood flow is to determine the systolic pressure below the aortic stenosis. A clinical study comparing 180 extremities from 140 patients with ischemia of the lower limbs with 40 extremities from 20 healthy control subjects was conducted. The presence of a pressure gradient below or above the knee indicated an occlusion of the femoral or popliteal artery. Ultrasonic studies of 72 patients with clinically suspected or confirmed aneurysms of the abdominal aorta and peripheral arteries permitted correct diagnosis in 92% of cases without recourse to aortic arteriography. The findings suggest that ultrasonic tests can replace arteriography in the diagnosis and postoperative management of aneurysms of the abdominal aorta and peripheral arteries. Author

**N84-29443#** Rochester Univ., N. Y. School of Medicine and Dentistry.

**MICROWAVES AND HUMAN LEUKOCYTE FUNCTION: EXPOSURE OF HUMAN MONONUCLEAR LEUKOCYTES TO MICROWAVE ENERGY PULSE-MODULATED AT 16 HZ OR AT 60 HZ Final Report, 1 Feb. 1983 - 1 Feb. 1984**

N. J. J. ROBERTS, S. M. MICHAELSON, and S. T. T. LU Apr. 1984 15 p (Contract F33615-83-K-0609; AF PROJ. 7757) (AD-A141071; USAFSAM-TR-84-9) Avail: NTIS HC A02/MF A01 CSDL 06R

Human mononuclear leukocytes were exposed to 2450 MHz microwaves pulse-modulated at 16 Hz or at 60 Hz, at specific absorption rates up to 4 mW/ml. Such exposures produced no detectable effects on leukocyte viability, or on unstimulated or mitogen-stimulated DNA synthesis or total protein synthesis. The data provided no evidence that exposure to pulse-modulated microwaves in more likely to alter human leukocyte function than is exposure to continuous waves at equivalent energy levels. GRA

**N84-29444#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**MAXIMAL POWER OUTPUTS DURING THE WINGATE ANAEROBIC TEST**

J. F. PATTON, M. M. MURPHY, and F. A. FREDERICK 3 May 1984 18 p (AD-A141374; USARIEM-M-23/84) Avail: NTIS HC A02/MF A01 CSDL 06S

The purpose of this study was to determine the resistance settings which elicit maximal values of power output (PO) values during performance of the Wingate Test (WT). Nineteen male

subjects performed multiple WT in a random order at resistance settings ranging from 0.055 to 0.115 kg/kg BW. Tests were carried out on a Monark cycle ergometer modified to permit instantaneous application of resistance. Revolutions were determined by a computer interfaced frequency counter. The mean resistance settings eliciting the highest peak power (PPO) and mean power (MPO) outputs were 0.096 and 0.094 kg/kg BW, respectively (average setting of 0.095 kg/kg BW). Both PPO and MPO were significantly higher (15.5% and 13.0%, respectively) using a resistance setting of 0.095 compared to the Wingate setting of 0.075 kg/kg BW. The test-retest reliability for PPO and MPO ranged between 0.91 and 0.93 at both resistance settings. Body weight, % body fat and thigh volume did not significantly estimate the individual resistance settings eliciting maximal PO's. The data suggest that resistance be assigned according to the subjects BW but consideration be given to increasing this resistance from that presently used in various laboratories. GRA

**N84-29445#** Naval Submarine Medical Research Lab., Groton, Conn.

**VISUAL CLARITY WITH A BLACK-AND-WHITE SCENE Interim Report**

J. A. WORTHEY 30 Mar. 1984 20 p (AD-A141498; NSMRL-975) Avail: NTIS HC A02/MF A01 CSDL 05J

Visual clarity experiments are usually done with colorful test objects, and it is generally concluded that the results of such experiments are related to the color-rendering properties of the illuminants involved. Nonetheless, it has been observed that a clarity difference between illuminants may be seen, even with black-and-white objects. An experiment was performed to measure differences of perceived clarity using only black-and-white fabric and black yarn as test objects. (The word clarity was not used in the instructions to subjects. They were asked questions concerning preference and blackness.) The differences measured seem to indicate a role for color in black-and-white vision, but not a pure clarity effect independent of illuminant color. GRA

**N84-29446#** New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.

**EYE ACCOMMODATION, PERSONALITY, AND AUTONOMIC BALANCE**

V. J. GAWRON Nov. 1979 96 p (Contract AF-AFOSR-0024-80; AF PROJ. 2313) (AD-A141499; BEL-79-2/AFOSR-79-6; AFOSR-84-0427TR) Avail: NTIS HC A05/MF A01 CSDL 05J

The automatic nervous system is made up of two subsystems: the parasympathetic (PNS) and the sympathetic (SNS). The balance between these systems regulates bodily functioning during routine (PNS-dominant) and crisis (SNS-dominant) situations. It also controls visual accommodation for near (PNS-dominant) and far (SNS-dominant) focus. The balance between these physiological systems has been linked to individual differences in personality characteristics, especially introversion (PNS-dominant) and extraversion (SNS-dominant). Since the balance mediates accommodation, the similar personality differences between near- and far-sighted individuals may be related to the more general parasympathetic-sympathetic balance rather than being related solely to the visual capability difference. The relationships among autonomic balance (as measured by a battery of four physiological tests modified from Wenger and Ellington, 1943, and by a technique introduced by Porges, 1976), refractive error (measured by dark focus, near and far points using a polarized vernier optometer), and introversion - extraversion (Eysenck Personality Inventory introversion - extraversion scale core) were investigated. GRA

**N84-29447#** California Univ., Torrance. Dept. of Psychiatry.  
**STRESS BIOCHEMISTRY: NON-INVASIVE MEASUREMENT TECHNIQUES IN MILITARY SUBJECTS Final Report, Oct. 1980 - Jun. 1983**

R. T. RUBIN and R. E. POLAND 23 Apr. 1984 12 p  
 (Contract N00014-81-K-0561)  
 (AD-A141598) Avail: NTIS HC A02/MF A01 CSCL 06A

The focus of the studies was on the relationship between saliva and plasma steroid hormones, under basal conditions, suppression with dexamethasone, and simulated field conditions of exercise. The results demonstrate a very good correspondence between saliva and serum cortisol, such that saliva cortisol measures can be substituted for blood drawing for cortisol, as a non-invasive means of measuring levels of this stress-related hormone. Under conditions of physical exercise, saliva and serum cortisol levels did not change. Results with testosterone suggest that saliva testosterone also reflects serum testosterone fairly closely, although the relationship is not as good as that for cortisol. Physical exercise did result in an approximately 20% increase in both plasma and saliva testosterone concentrations. Finally, the correlation between saliva and serum melatonin was examined. While melatonin is measurable in saliva, it appears to correlate very poorly with serum melatonin, thus not being a useful reflection of serum melatonin. Work continues on the possibility of measuring a melatonin metabolite in saliva, which might more accurately reflect circulating melatonin levels in serum or plasma. GRA

**N84-29448#** Army Aeromedical Research Unit, Fort Rucker, Ala.

**DEVELOPMENT OF A MICROPROCESSOR BASED AUDIOMETER FOR THRESHOLD SHIFT STUDIES**

B. T. MOZO, J. H. PATTERSON, JR., R. MARROW, W. R. NELSON, and I. M. LOMBA-GAUTIER Mar. 1984 12 p  
 (Contract DA PROJ. 3E1-62777-A-878)  
 (AD-A142124; USAARL-84-7) Avail: NTIS HC A02/MF A01 CSCL 06P

In order to permit the collection of data on hearing threshold shift resulting from firing Army weapons, a multichannel microprocessor-controlled audiometer was developed. The system features four synchronized channels for determining hearing thresholds by a fixed frequency, fix test-time Von Bekesy tracking method. Nonstandard, noise excluding headsets were developed as part of the system. Biological calibration of the system was accomplished by comparison to a clinical audiometer and a validation test was completed to demonstrate system accuracy and reliability. The results indicate the system is as accurate as, and more reliable than, the clinical audiometer. Author (GRA)

**N84-29449#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**RECOMMENDATIONS FOR THE CONDUCT OF PHYSICAL TRAINING IN COLD WEATHER**

W. L. DANIELS and J. DZIADOS 1 Jun. 1984 11 p  
 (AD-A142137; USARIEM-M-24/84) Avail: NTIS HC A02/MF A01 CSCL 06S

These suggestions are meant to be guidelines to the Commander for the safe conduct of physical training during cold weather. This presentation presents guidelines for the conduct of physical training in cold weather. Training guidelines are presented to cover such areas as temperature, humidity, cold and injury prevention. GRA

**N84-29450#** Kentucky Univ., Lexington. Research Lab.  
**RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESSES Final Report, 1 Oct. 1982 - 30 Sep. 1983**

C. F. KNAPP, J. M. EVANS, D. C. RANDALL, J. B. CHARLES, and B. S. KELLEY 30 Nov. 1983 238 p  
 (Contract F49620-83-K-0002)  
 (AD-A142166; AFOSR-84-0482TR) Avail: NTIS HC A11/MF A01 CSCL 06S

Contents: Heart Rate Responses of Humans to Sinusoidally Varying + or - 1 Gz Gravitational Stress; A new chronically

instrumented animal preparation in which heart rate (via AV sequential pacing) can be computer controlled in either an open or closed-looped manner; Cardiovascular Responses of Untrained and Endurance Trained Dogs to Oscillatory Blood Volume Shifts; and Changes in Peak Left Ventricular Wall Stress in Normal and Cardiac Denervated Canines During Sinusoidal Acceleration.

GRA

**N84-29451#** Advanced Research Resources Organization, Bethesda, Md.

**VALIDATION OF THE MILITARY ENTRANCE PHYSICAL STRENGTH CAPACITY TEST Technical Progress Report, Jan. 1982 - Jul. 1983**

D. C. MYERS, D. L. GEBHARDT, C. E. CRUMP, and E. A. FLEISHMAN Jan. 1984 88 p  
 (Contract MDA903-82-C-0140; DA PROJ. 2Q1-62722-A-791)  
 (AD-A142169; ARRO-R83-10; ARI-TR-610) Avail: NTIS HC A05/MF A01 CSCL 05I

A battery of physical ability tests was validated using a predictive, criterion-related strategy. The battery was given to 1,003 female soldiers and 980 male soldiers before they had begun Basic Training. Criterion measures which represented physical competency in Basic Training (i.e., physical proficiency tests, sick call, profiles, and separation data) as well as on the job (i.e., lifting, carrying, pushing, pulling activities) were correlated with the soldiers' scores on the physical ability tests. The job performance measures (i.e., criterion performance tasks) were designed to evaluate proficiency in the performance of tasks determined to be important in physically demanding Army jobs (i.e., Lift, Carry, Push and Torque). The criterion performance tasks were administered to the 951 soldiers who had completed Advanced Individual Training (AIT). The results indicated that test validity was high ( $R = .84$ ). The Lift 60 accounted for 67% of the variance in criterion performance, while Lean Body Mass (LBM) and the Upright Pull test accounted for an additional 3% and 1%, respectively. The fairness analysis showed that there were non-significant slope differences and only slight intercept differences which suggested minimal overprediction for women. GRA

**N84-29452#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**THE INFLUENCE OF CARDIORESPIRATORY FITNESS ON THE DECREMENT IN MAXIMAL AEROBIC POWER AT HIGH ALTITUDE**

A. J. YOUNG, A. CYMERMAN, and R. L. BURSE 11 Jun. 1984 21 p  
 (Contract DA PROJ. 3E1-62777-A-879)  
 (AD-A142218; USARIEM-M-25/84) Avail: NTIS HC A02/MF A01 CSCL 06S

There are conflicting reports in the literature which imply that the decrement in maximal aerobic power experienced by a sea-level (SL) resident sojourning at high altitude (HA) is either smaller or larger for the more aerobically fit person. In the present study, data collected during several investigations conducted at an altitude of 4300 m were analyzed to determine if the level of aerobic fitness influenced the decrement in maximal oxygen uptake ( $VO_2$  max) at HA. The  $VO_2$  max of 51 male SL residents was measured at an altitude of 50 m and again at 4300 m. GRA

**N84-29453#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**INFLUENCE OF HEAT STRESS AND ACCLIMATION ON MAXIMAL AEROBIC POWER**

M. N. SAWKA, A. J. YOUNG, B. C. CADARETTE, L. LEVINE, and K. B. PANDOLF Jun. 1984 20 p  
 (Contract DA PROJ. 3E1-62777-A-879)  
 (AD-A142329; USARIEM-M-27/84) Avail: NTIS HC A02/MF A01 CSCL 06S

Thirteen male volunteers performed cycle ergometer maximal oxygen uptake ( $VO_2$  max) tests in moderate (21 C, 30% rh) and hot (49 C, 20% rh) environments, before and after a nine-day heat acclimation program. This program resulted in significantly decreased ( $P < 0.01$ ) final heart rate (24 b/min) and rectal



temperature (0.4 C) from the first to last day of acclimation. The VO<sub>2</sub> max was lower ( $P < 0.01$ ) in the hot environment relative to the moderate environment both before (8%) and after (7%) acclimation with no significant difference ( $P > 0.05$ ) shown for maximal power output (PO max, watts) between environments either before or after acclimation. The VO<sub>2</sub> max was higher ( $P < 0.01$ ) by 4% after acclimation in both the moderate (4%) and hot (2%) environments. The reduction in VO<sub>2</sub> max in the hot compared to moderate environment was not related to the difference in core temperature at VO<sub>2</sub> max between moderate and hot trials, nor was it strongly related with aerobic fitness level. These findings indicate that heat stress, per se, reduced the VO<sub>2</sub> max. Further, the reduction in VO<sub>2</sub> max due to heat was not affected by state of heat acclimation, the degree of elevation in core temperature, or level of aerobic fitness. GRA

**N84-29454#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**UPPER BODY EXERCISE PERFORMANCE: COMPARISON BETWEEN WOMEN AND MEN**

J. E. FALKEL, M. N. SAWKA, L. LEVINE, N. A. PIMENTAL, and K. B. PANDOLF Jun. 1984 26 p

(Contract DA PROJ. 3E1-62777-A-879)

(AD-A142330; USARIEM-M-26/84) Avail: NTIS HC A03/MF A01 CSCL 06S

This study compared upper body (arm crank) aerobic fitness for a group of women ( $n = 8$ ) and men ( $n = 9$ ) matched for lower body (cycle) aerobic fitness and also examined the influence selected physiological factors had on upper body exercise performance. The components of upper body exercise studied included maximal power output (PO max), peak oxygen uptake (peak VO<sub>2</sub>), upper body isokinetic strength and endurance, arm volume, and endurance time at 80% arm crank peak VO<sub>2</sub>. During maximal effort upper body exercise, there was no difference in peak VO<sub>2</sub> between the genders despite the men's significantly greater strength, arm volume and PO max. There were no differences in upper body peak VO<sub>2</sub> when the gender differences in arm volume were accounted for. Likewise, there was no difference in upper body endurance time at 80% peak VO<sub>2</sub> between the genders. These data indicated that: (1) women do not have an inherent disadvantage to perform upper body exercise; (2) skeletal muscle strength provides a relatively minor influence on both maximal effort and prolonged upper body exercise; (3) individuals can perform prolonged upper body exercise at relative intensities greater than that needed to elicit an aerobic training effect. GRA

**N84-29455#** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.

**A RE-EVALUATIONS OF CANCELLATION THEORY: VISUAL, VESTIBULAR AND OCULOMOTOR CONTRIBUTIONS TO PERCEIVED OBJECT MOTION**

A. H. WERTHEIM and W. BLES Mar. 1984 58 p refs  
(AD-B082936; IZF-1984-8; TDCK-79148) Avail: NTIS HC A04/MF A01

A theoretical framework and experimental paradigm for investigations of perceived object motion are presented. The approach consists of an extended version of cancellation theory, but differs from more traditional versions in that it yields a quantitative measure of a just noticeable difference between signals which carry information about retinal image movement (retinal signals) and signals which carry information about eye and head movements (reference signals); yields a quantitative measure of the precision with which movements of the eyes and head are registered within reference signals; and includes modulation of the reference signals as result of retinal image movements.

Author (ESA)

**N84-29468\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**PHYSIOLOGICAL FUNCTIONING OF THE EAR AND MASKING**  
*In its* Physiol., Psychol., and Social Effects of Noise p 25-56  
Jul. 1984 refs

Avail: NTIS HC A99/MF A01 CSCL 06P

The physiological functions of the ear and the role masking plays in speech communication are examined. Topics under investigation include sound analysis of the ear, the aural reflex, and various types of noise masking. M.A.C.

**N84-29472\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**NOISE-INDUCED HEARING LOSS AND ITS PREDICTION**

*In its* Physiol., Psychol., and Social Effects of Noise p 219-330  
Jul. 1984 refs

Avail: NTIS HC A99/MF A01 CSCL 06P

There are two somewhat different questions to be answered from data showing a permanent shift in the threshold of hearing (i.e., hearing loss) because of exposure to noise. The most fundamental question is what is the maximum level of daily noise exposure over a period of years that will not cause a measurable hearing loss (beyond that due to aging) in general population. The second question, and one of practical interest to industry, is what level of industrial noise exposure causes measurable noise-induced hearing loss in factory workers? Selected data on hearing level (HL) and present state-of-the-art solutions related to the measurement and prediction of noise-induced permanent threshold shift (NIPTS) and temporary threshold shift (TTS) are presented. A brief summary of some articles and reports published since 1963 on procedures for predicting NIPTS from exposure to noise is given. B.G.

**N84-29473\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**NOISE-INDUCED HEARING IMPAIRMENT AND HANDICAP**

*In its* Physiol., Psychol., and Social Effects of Noise p 331-342  
Jul. 1984 refs

Avail: NTIS HC A99/MF A01 CSCL 06P

A permanent, noise-induced hearing loss has doubly harmful effect on speech communications. First, the elevation in the threshold of hearing means that many speech sounds are too weak to be heard, and second, very intense speech sounds may appear to be distorted. The whole question of the impact of noise-induced hearing loss upon the impairments and handicaps experienced by people with such hearing losses was somewhat controversial partly because of the economic aspects of related practical noise control and workmen's compensation. Author

**N84-30643#** Joint Publications Research Service, Arlington, Va.  
**USE OF VITAMINS DURING ADAPTATION TO HIGH ALTITUDES**

M. S. BELAKOVSKIY, N. G. BOGDANOV, Y. B. GIPPENREYTER, and A. S. USHAKOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 1-8 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 4-9

Avail: NTIS HC A07

Adaptation to a high altitude environment is accompanied by various metabolic changes. It is recommended to use essential nutrients--vitamins to optimize adaptation to this environment and to maintain adequate work capacity and good health. M.A.C.

**N84-30644#** Joint Publications Research Service, Arlington, Va.  
**RELIABILITY AND EFFICIENCY OF KUBICEK RHEOGRAPHIC METHOD FOR MONITORING CARDIAC OUTPUT AND STROKE VOLUME**

A. M. GENIN, L. S. ZINGERMAN, D. G. MAKSIMOV, G. Y. BELOZEROV, V. P. KATUNTSEV, M. V. OBUKHOVA, K. S. YUROVA, G. I. KHEYMETTS, V. A. GALICHIY, and R. I. FINAOGENOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 9-15 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 9-14

Avail: NTIS HC A07

Simultaneous measurements by the Fick direct method and the Kubicek rheographic method of cardiac output of 20 men with ischemic heart disease show that both methods are well correlated. The reproducibility of the Kubicek data is better than the Fick data. In order to provide the necessary accuracy of the Kubicek method, it is required that the procedure be stringent and the five variables in the formula for calculating cardiac output be precisely measured. The cardiac output values determined simultaneously by the Kubicek method and by X ray contrast ventriculography showed a better correlation. M.A.C.

**N84-30645#** Joint Publications Research Service, Arlington, Va.  
**WALKING ERECT AS A FACTOR IN DEVELOPMENT OF ARTERIAL HYPERTENSION IN PRIMATES**

G. S. BELKANIYA and V. A. DARTSMELIYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 16-23 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 14-19

Avail: NTIS HC A07

Time course changes in the cardiovascular function of rhesus monkeys are investigated during forced orthograde statics and upright walking. Arterial pressure by Korotkoff sounds (in certain cases by a direct method in the femoral artery) and major parameters of central hemodynamics by tetrapolar thoracic rheography are measured. The monkeys develop stable arterial hypertension three months after the onset of the upright study. Hemodynamic parameters reflect circulation centralization, formation of the hyperkinetic type of the orthostatic reaction and development of arterial hypertension of the resistive type. It is suggested that orthostatics may contribute to the development of arterial hypertension. M.A.C.

**N84-30646#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF DIHYDROERGOTAMINE ON HUMAN CIRCULATION DURING ORTHOSTATIC TESTS**

A. Y. MODIN, S. V. ABROSIMOV, O. D. ANASHKIN, V. V. ZHIDKOV, V. I. LOBACHIK, L. B. PARASHIN, and V. S. SHASHKOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 24-28 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 19-23

Avail: NTIS HC A07

The physiological effects of zero g are simulated by 6 hour antiorthostatic hypokinesia at -13 degrees, using eight healthy volunteers. During the first study the test subjects received a placebo and during the second study they get 6 mg dihydroergotamine methane sulfonate per os. Radiometric examinations of the whole body and its compartments (head, chest, abdomen, legs) show that the drug increased blood pooling in the upper body and decreased it in the lower body at every position of the long axis of the body relative to the gravity vector. M.A.C.

**N84-30647#** Joint Publications Research Service, Arlington, Va.  
**CIRCULATORY CHANGES IN ORTHOSTATIC POSITION IN THE PRESENCE OF HYPERTHERMIA**

V. I. SOBOLEVSKIY and V. P. PRAVOSUKOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 29-32 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 23-25

Avail: NTIS HC A07

Orthostatic tolerance does not deteriorate if the level of hyperthermia and weight losses are controlled. Orthostatic intolerance develops at a critical level of hyperthermia and water losses. The mechanisms of this effect are described. M.A.C.

**N84-30648#** Joint Publications Research Service, Arlington, Va.  
**BLOOD PLASMA FREE AMINO ACIDS UNDER HYPOKINETIC CONDITIONS**

I. G. POPOV and A. A. LATSKEVICH *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 33-43 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 25-34

Avail: NTIS HC A07

The study of 17 free amino acids in plasma of six healthy men under ambulatory and hypokinetic conditions demonstrates that by day 15 of clinostatic hypokinesia the content of most amino acids increases and by day 30 decreases reaching the pretest level or falling below it. These variations in the amino acid concentration are viewed as a consequence of the modified relations between anabolic and catabolic processes induced by adaptation to hypokinesia. It is emphasized that the nutrition pattern was different in the hypokinetic study. M.A.C.

**N84-30649#** Joint Publications Research Service, Arlington, Va.  
**HUMAN STOMACH MOTOR AND EVACUATORY FUNCTIONS DURING ANTIORTHOSTATIC HYPOKINESIA**

K. V. SMIRNOV, A. N. PETRUSENKO, and A. P. MENSCHCHIKOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 44-49 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 34-38

Avail: NTIS HC A07

After overnight fasting test subjects exposed to head down tilt show an increase in the amplitude of stomach biopotentials, thus suggesting an increase in its contractile force. A provocative food test demonstrates an increase in the excitability of the stomach neuromuscular apparatus due to 30 day head down tilt, which includes an increment of contraction amplitudes and rates. An analysis of the wave amplitude composition shows a shift to the right which is most distinct in the fasting state. Stomach motor activity in the digestive period shows a greater resistance to head down tilt. An increase in the asymmetry coefficient before and after food intake proportional to the head down tilt duration suggests that the stomach evacuatory activity is inhibited. M.A.C.

**N84-30650#** Joint Publications Research Service, Arlington, Va.  
**CIRCADIAN PATTERN OF SIMIAN FUNCTIONAL PARAMETERS DURING HYPOKINESIA AND IN THE RECOVERY PERIOD**

N. F. KOLPAKOVA and T. G. URMANCHEYEVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 50-57 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 38-43

Avail: NTIS HC A07

Seven male rhesus monkeys, aged 3.5 to 4 years, were examined during clinostatic hypokinesia for 20 to 40 days and after exposure for 16 days. Parameters of the cardiovascular function, external respiration and body temperature were measured. During and after hypokinesia the amplitude of diurnal variations of heart rate tended to decrease. The position of heart rate acrophases shifted most during the first three weeks of hypokinesia

and during recovery. Changes in the amplitude of diurnal variations of arterial pressure were different. The position of acrophases on the time axis was unstable and tended to recover by hypokinesia days 30 to 40 and then shifted again on the 1st recovery day. The amplitude of diurnal variations of the respiration rate increased, the position of acrophases on the time axis shifted and their width changed. By the 14th day of readaptation the diurnal dynamics of this parameter tended to recover. During hypokinesia the amplitude of diurnal variations of body temperature increased or decreased and the position of acrophases on the time axis remained stable.

M.G.

**N84-30654#** Joint Publications Research Service, Arlington, Va.  
**FUNCTIONAL STATE AND WORK CAPACITY OF MAN WHEN BREATHING OXYGEN AND HYPOXIC MIXTURES UNDER POSITIVE PRESSURE**

M. D. DRAGUZYA, V. I. KOPANEV, and S. I. LUSTIN *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 79-83 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 57-60

Avail: NTIS HC A07

Experiments were carried out at sea level to investigate tolerance and work capacity of test subjects breathing 100% oxygen and hypoxic gas mixtures (HGM) containing 12.7 to 12.8% O<sub>2</sub> at a positive pressure of 800 mm H<sub>2</sub>O. All test subjects tolerated 1 hour exposure to 100% O<sub>2</sub> or HGM under positive pressure. However, HGM induced more distinct cardiopulmonary changes than O<sub>2</sub>. During the first minutes of exposure to positive pressure breathing the tracking performance deteriorated most. The number of errors was 24.5% with O<sub>2</sub> and 21.4% with HGM more than in the pretest study. As the adaptation developed, the number of tracking errors decreased to reach the pretest level with O<sub>2</sub> and to remain 6 to 10% higher than the pretest level with HGM.

M.G.

**N84-30658#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF HIGH AMMONIA CONTENT IN PRESSURE CHAMBER ATMOSPHERE ON HUMAN ADRENOCORTICAL SYSTEM FUNCTION**

S. KALANDAROV, V. P. BYCHKOV, I. D. FRENKEL, and T. I. KUZNETSOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 107-110 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 75-77

Avail: NTIS HC A07

The effect of various ammonia concentrations in an enclosed atmosphere on man's adrenocortical system was investigated in five experiments on 20 young healthy test subjects. The most pronounced changes in the adrenocortical system developed when the ammonia content was 5 mg l cu m.

Author

**N84-30659#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF LIVING CONDITIONS IN CONFINED SPACE ON FORMATION OF BACTERIAL AEROSOL**

G. O. POZHARSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 111-125 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 77-80

Avail: NTIS HC A07

The effect of environmental conditions (the presence of a different number of people, various parameters of the atmosphere, operation of life support systems) on the formation of bacterial aerosol was investigated. If the number of people in the enclosure increases, the bacterial aerosol formation depends primarily on the system of atmosphere conditioning. If the system functions, the occurrence of microorganisms on the internal surface grows. These findings may be used to design life support systems and to develop special measures that provide hygienic and antiepidemic conditions in a manned enclosure.

Author

**N84-30660#** Joint Publications Research Service, Arlington, Va.  
**NOMOGRAM FOR DEMONSTRATING CHANGE IN CENTRAL VENOUS AND PULMONARY ARTERY PRESSURE DURING DECOMPRESSION OF DIFFERENT PARTS OF THE BODY**

V. Y. KATKOV and V. V. RUMYANTSEV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 126-127 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 89-90

Avail: NTIS HC A07

Different series of comprehensive studies were made of the effects of negative pressure (NP) on the different parts of the human body: local NP to the legs, NP to the abdominal region and NP to the bottom half of the human body. In essence, the effect of this factor on central circulation was investigated, in particular, on such of its important parameters as central venous pressure (CVP) and pressure in the pulmonary artery (PPA). For convenience in evaluating the effect of NP, a nomogram is proposed.

B.G.

**N84-30661#** Joint Publications Research Service, Arlington, Va.  
**DEPENDENCE OF BLOOD COAGULATING AND FIBRINOLYTIC SYSTEMS ON FUNCTIONAL STATE OF LYSOSOMAL SYSTEM OF NEUTROPHIL LEUKOCYTES DURING EXPOSURE OF THE BODY TO LOW BAROMETRIC PRESSURE**

N. V. LUNINA and A. F. POLTAVSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 128-131 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 90-92

Avail: NTIS HC A07

Typical changes are observed in the blood system when man and animals are exposed to low barometric pressure, which are important to the body's adaptation to changing environmental conditions. There is stimulation of myelopoiesis noted in the peripheral blood. Animal experiments show that when the body is exposed to noninfectious stressors, in particular, acute loss of blood, not only is the development of absolute neutrophil leukocytosis, but there is a decrease in the number of neutrophilleukocyte lysosomes. The possible correlation between decrease in number of lysosomes in neutrophils and change in activity of blood clotting and fibrinolytic systems when animals are exposed to low barometric pressure was investigated. The lysosomal marker enzyme, cathepsin D, which is a measure of the functional activity of lysosomes and parameters of blood clotting and fibrinolytic systems was assayed in blood plasma.

B.G.

**N84-30662#** Joint Publications Research Service, Arlington, Va.  
**SIMULATION OF PHYSIOLOGICAL EFFECTS OF NEGATIVE PRESSURE ON MAN**

V. V. RUMYANTSEV and V. Y. KATKOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 132-134 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 92-93

Avail: NTIS HC A07

Pressure in the pulmonary artery and central venous pressure are informative indicators for evaluation of the effects of lower body negative pressure and local negative pressure to both legs and the abdominal region. With the use of these indicators, a mathematical model was developed that describes the changes in central circulation during decompression of different parts of the human body.

B.G.

**N84-30663#** Joint Publications Research Service, Arlington, Va.  
**INDIVIDUAL DISTINCTIONS OF HUMAN SLEEPING RESPIRATION AT ALTITUDE OF 4200 METERS**

Y. P. GORA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 3, May - Jun. 1984 (JPRS-USB-84-005) p 135-138 3 Jul. 1984 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 3, May - Jun. 1984 p 93-95

Avail: NTIS HC A07

The study of respiration during sleep under hypoxic conditions makes it possible to investigate more thoroughly the mechanisms of adaptation. Studies of physiology of sleep under normal conditions establish a relationship between different sleep phases and specific nature of breathing. In a drowsy state, respiration is often periodic; during slow deep sleep it is rhythmic and there is attenuation of pulmonary ventilation. The stage of rapid eye movement (REM) corresponds to some increase in ventilation with non-rhythmic breathing. At the present time, a clearcut idea about the relationship between different phases of sleep and the specific nature of respiration at high altitudes is not available. The individual distinctions of change in respiration during nocturnal sleep at the first stage of adaptation to hypoxia were studied. Author

**N84-30679#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF CONSTANT AND LOW-FREQUENCY MAGNETIC FIELDS ON BIOLOGICAL SYSTEMS Abstract Only**

L. A. PIRUZYAN and A. N. KUZNETSOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 66 30 Jul. 1984 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Biol. (Moscow), no. 6, Nov. - Dec. 1983 p 805-821

Avail: NTIS HC A06

The biological effects of constant and low frequency magnetic fields were investigated. The course of this investigation along with some results and future prospects were discussed. Various levels of organization of biological and model systems were examined. Electromagnetics with a high degree of stability and field homogeneity were used in most of the experiments. The studies performed indicate that magnetic fields do have an effect on some biological systems under some conditions. The large numbers of negative results demonstrate that there is as yet no accurate understanding of the mechanisms of action of such fields. The liquid crystal hypothesis and the spin block hypothesis remain the strongest contenders for explanation of the biological effects, although they do not exclude other possible mechanisms. The weak nature of the effects in comparison to chemical and other effects forces great caution in the performance of experiments. Author

**N84-30683\*** National Aeronautics and Space Administration, Washington, D. C.  
**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 261)**

Aug. 1984 82 p

(NASA-SP-7011(261); NAS 1.21:7011(261)) Avail: NTIS HC \$7.00 CSCL 06E

This bibliography lists 281 reports, articles and other documents introduced into the NASA scientific and technical information system in July 1984. Author

**N84-30684\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.  
**INCREASE IN WHOLE-BODY PERIPHERAL VASCULAR RESISTANCE DURING THREE HOURS OF AIR OR OXYGEN PREBREATHING**

J. M. WALIGORA, D. J. HERRIGAN, J. CONKIN (Technology Inc.), J. J. DIERLAM (Technology Inc.), J. STANFORD, JR. (Technology Inc.), and J. R. RIDDLE (Technology Inc.) Aug. 1984 15 p refs

(Contract NAS9-17200)

(NASA-TM-58261; S-537; NAS 1.15:58261) Avail: NTIS HC A02/MF A01 CSCL 06E

Male and female subjects prebreathed air or 100% oxygen through a mask for 3.0 hours while comfortably reclined. Blood

pressures, heart rate, and cardiac output were collected before and after the prebreathe. Peripheral vascular resistance (PVR) was calculated from these parameters and increased by 29% during oxygen prebreathing and 15% during air prebreathing. The oxygen contributed substantially to the increase in PVR. Diastolic blood pressure increased by 18% during the oxygen prebreathe while systolic blood pressure showed no change under either procedure. The increase in PVR during air prebreathing was attributed to procedural stress common to air and oxygen prebreathing.

Author

**N84-30685#** Colorado Univ., Boulder. Inst. of Behavioral Genetics.**ORGANOPHOSPHATE TOXICITY: GENETICS, RECEPTORS, AND ANTIDOTES Annual Progress Report, 15 Sep. 1982 - 14 Sep. 1983**

A. C. COLLINS Nov. 1983 44 p

(Contract AF-AFOSR-0300-82; AF PROJ. 2312)

(AD-A141059; AFOSR-84-0400TR) Avail: NTIS HC A03/MF A01 CSCL 06T

Studies were completed on the time course of the effect of DFP on brain acetylcholinesterase ACH activity. While brain ACH activity is maximally depressed only 5 minutes after administration, most behavior effects require two or more hours before the maximal effect is seen. Following a 6.33 mg/kg dose of DFP the activity of brain ACH does not return to control levels, even after 30 days. This effect is dose-dependent and affects all brain regions equally. Behavioral studies as well as studies to demonstrate tolerance to DFP have been conducted. Pyridine Chemistry has been studied in an attempt to develop nicotinic receptor agonists. GRA

**N84-30686#** Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.**PRISM: A PRACTICAL REAL-TIME IMAGING STEREO MATCHER**

H. K. NISHIHARA May 1984 34 p

(Contract N00014-80-C-0505)

(AD-A142532; AI-M-780) Avail: NTIS HC A03/MF A01 CSCL 17H

A binocular-stereo-matching algorithm for making rapid visual range measurements in noisy images is described. This technique is developed for application to problems in robotics where noise tolerance, reliability and speed are predominant issues. A high speed pipelined convolver for preprocessing images and an unstructured light technique for improving signal quality are introduced to help enhance performance to meet the demands of this task domain. These optimizations, however, are not sufficient. A closer examination of the problems encountered suggests that broader interpretations of both the objective of binocular stereo and of the zero-crossing theory of Marr and Poggio are required. In this paper, we restrict ourselves to the problem of making a single primitive surface measurement. For example, to determine whether or not a specified volume of space is occupied, to measure the range to a surface at an indicated image location, or to determine the elevation gradient at that position. In this framework, we make a subtle but important shift from the explicit use of zero-crossing contours (in band-pass filtered images) as the elements matched between left and right images, to the use of the signs between zero-crossings. With this change, we obtain a simpler algorithm with a reduced sensitivity to noise and a more predictable behavior. The PRISM system incorporates this algorithm with the unstructured light technique and a high speed digital convolver. It has been used successfully by others as a sensor in a path planning system and a bin picking system. GRA

**N84-30687#** Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

**COMPUTATIONAL EXPERIMENTS WITH A FEATURE BASED STEREO ALGORITHM**

W. E. L. GRIMSON Jan. 1984 40 p

(Contract N00014-80-C-0505; N00014-82-K-0334)

(AD-A142549; AI-M-762) Avail: NTIS HC A03/MF A01 CSCL 20F

Computational models of the human stereo system can provide insight into general information processing constraints that apply to any stereo system, either artificial or biological. In 1977, Marr and Poggio proposed one such computational model, that was characterized as matching certain feature points in difference-of-Gaussian filtered images, and using the information obtained by matching coarser resolution representations. An implementation of the algorithm and its testing on a range of images was reported in 1980. Since then a number of psychophysical experiments have suggested possible refinements to the model and modifications to the algorithm. As well, recent computational experiments applying the algorithm to a variety of natural images, especially aerial photographs, have led to a number of modifications. In this article, we present a version of the Marr-Poggio-Grimson algorithm that embodies these modifications and illustrate its performance on a series of natural images.

Author (GRA)

**N84-30688#** Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.

**GUIDELINES FOR RUNNING THE THERMAL COMPUTATIONAL MODEL OF THE EYE**

W. J. MARSHALL and T. J. WHITE Jun. 1984 51 p

(AD-A142550) Avail: NTIS HC A04/MF A01 CSCL 06R

A computational thermal model of the eye was developed during the 1970's. The program was set up in cylindrical coordinates allowing various pulse shapes in time and space. Improvements in the latest version were the addition of a damage calculation and an iterative technique for achieving a uniform damage level for comparison between computer runs. A user-friendly computer listing and data samples are included as well as instructions for making a computer run.

GRA

**N84-30689#** Boston Univ., Mass. Center for Adaptive Systems. **NONLINEAR DYNAMICS OF MULTI-CHANNEL BINOCULAR VISION Annual Scientific Report, 1 Feb. 1983 - 31 Jan. 1984**

S. GROSSBERG 7 Mar. 1984 20 p

(Contract F49620-83-C-0066)

(AD-A142600; AFOSR-84-0527TR) Avail: NTIS HC A02/MF A01 CSCL 06D

Progress was made in three related areas: vision, movement, and rhythm. A realtime processing theory was introduced of how the visual system discounts several types of noise in visual data, yet rapidly generates global visual representations. These mechanisms can be interpreted both behaviorally and neurally. The mechanisms describe new parallel processing algorithms that operate within hierarchical networks. Simulations were made of real and illusory contour formation, neon color spreading, complementary color induction, and filling-in. The theory physically interprets and generalizes Land's retinex theory of color vision, and unifies the explanation of monocular and binocular brightness data. The simulated data include Craik-O'Brien effects and their exceptions; the Bergstrom demonstrations comparing brightness of smoothly modulated and step-like luminance profiles; nonclassical differences between the perception of luminance decrements and increments; Fechner's paradox, binocular brightness averaging, and binocular brightness summation; binocular rivalry; and fading of stabilized images and ganzfelds. Two parallel contour processes interact to generate the theory's brightness, color, and form explanations.

GRA

**N84-30690#** Armed Forces Radiobiology Research Inst., Bethesda, Md.

**THE TOXICITY OF PETROLEUM AND SHALE JP5**

V. BOGO, R. W. YOUNG, T. A. HILL, C. L. FESER, and J. NOLD Sep. 1983 25 p

(AD-A142670; AFRRR-SR83-26) Avail: NTIS HC A02/MF A01 CSCL 06T

The toxicity of petroleum- and shale-derived jet propulsion fuel no. 5 (JP5) was evaluated in a series of acute average and subchronic inhalation studies with rats. In the gavage studies, the LD50/14 for rats was 26 ml/kg for Gary-Western shale, 39 ml/kg for Sohio shale and greater than 60 ml/kg for Exxon shale and petroleum JP5. Significant hepatic periportal fatty degeneration and renal eosinophilic hyaline droplets were observed for all fuels. Multiple hepatic cytoplasmic vacuoles were detected as early as 6 hours after both petroleum and Sohio shale JP5 exposures but were undetectable after 96 hours. Weight and consumption of food and water were reduced for 2 to 3 days after administration of petroleum or Sohio shale JP5. Activity markedly increased between 2.5 and 6 hours after dosing for both petroleum and Sohio shale JP5. The inhalation studies showed that water consumption increased after 8 days of exposure to petroleum or Sohio shale and remained elevated for the duration of the 30-day studies. However, no significant effects on tissue morphology or hepatic and renal serum chemistries were observed after exposure to petroleum or Sohio shale JP5, and peak amplitudes or latencies for the SEPs did not significantly change during the 30-day exposure to Sohio shale JP5.

GRA

**N84-30691#** University of Western Michigan, Kalamazoo. Dept. of Biomedical Sciences.

**USE OF SPERM ENZYMES TO DETECT GENOTOXIC AGENTS Final Report, Feb. 1983 - Feb. 1984**

L. C. GINSBERG, G. FICSOR, W. C. KELLER, and B. M. LLEWELLYN May 1984 23 p

(Contract F33615-83-K-0504)

(AD-A142724; AFAMRL-TR-84-020) Avail: NTIS HC A02/MF A01 CSCL 06T

The sperm enzyme test (SET) system consists of a series of histochemical assays that can be used to assess the functionality of sperm. The objective of this research was to determine the usefulness of the SET system in evaluation of germ cell damage which might be caused by a variety of chemicals. Mice were treated with several known mutagenic or teratogenic agents, or chemicals toxic to the reproductive system two and six weeks before collecting sperm. Sperm was stripped from the vas deferens and examined for count, motility, and the sperm enzymes, acrosin, hyaluronidase, succinic dehydrogenase (SDH), and alpha glycerolphosphate dehydrogenase (aGDH) activities. Groups of mice were treated through intraperitoneal (i.p.) or inhalation (i.h.) routes. Two weeks after treatment, the chemicals ethylnitrosourea (ENU), ethyl methanesulfonate (EMS), hydroxyurea (HU), cigarette smoke condensate (CSC), dimethyl methylphosphonate (DMMP), perfluoro-n-decanoic acid (PFDA), ethylene dibromide (EDB), and benzene were found to be positive by the SET system. At six weeks, only ENU, HU and DMMP exposures caused enzyme changes significantly different from controls, while only ENU and HU caused reduced testis weight, a conventional method of germ cell damage assessment. Two weeks after i.h. treatment, benzene and EDB were found to be positive for sperm enzyme changes, while at six weeks postexposure only DMMP was detected.

GRA

**N84-30692#** Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.

**THIRD WORLD CONGRESS ON EMERGENCY AND DISASTER MEDICINE**

I. WIDEGREN Apr. 1984 12 p refs In SWEDISH; ENGLISH summary Congr. held at Rome, 24-27 May 1983

(FOA-C-52005-H4; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Emergency medicine disaster medicine, personnel aspects,

disaster services organization, health services cooperation, and civilian-military collaboration were discussed. Author (ESA)

**N84-30693#** Istituto Superiore di Sanita, Rome (Italy).  
**PRELIMINARY RESULT OF OUR NEW NATIONWIDE EVALUATION OF X-RAY TRENDS (NEXT) PROGRAM FOR ITALY**

A. CALICCHIA, P. L. INDOVINA, A. MARCHETTI (European Nuclear Energy Agency, Rome), and M. P. FIORATTI (European Nuclear Energy Agency, Rome) 10 Apr. 1984 13 p refs Presented at Sci. Seminar on Criteria and Meth. for Quality Assurance in Med. X-ray Diagnosis, Udine, 17-19 Apr. 1984 Submitted for publication

(ISS-L-84/3) Avail: NTIS HC A02/MF A01

The Nationwide Evaluation of X-ray Trends program was adapted to Italian conditions. Collection of all parameters influencing patient exposure is foreseen. Doses to major patient organs, such as thyroid, bone marrow, uterus, gonads, are computed. Apparatuses and radiological techniques responsible for excessively high doses are easily picked out and may then be revised or corrected. Authorities can choose the most adequate program to improve patient radiation protection. Results for a representative region are reported, and the influence of the program on quality assurance is shown. Author (ESA)

**N84-30694#** Southampton Univ. (England). Inst. of Sound and Vibration Research.

**AUDIOMETRIC CONFIGURATIONS AND REPEATABILITY IN NOISE-INDUCED HEARING LOSS**

D. W. ROBINSON Jun. 1984 30 p refs Sponsored by UK Medical Research Council

(ISVR-TR-123) Avail: NTIS HC A03/MF A01

The pure-tone audiograms of an otologically screened group of subjects with known noise exposures in a variety of industrial occupations are analyzed. Frequencies of the audiometric notch vary from 2.5 to over 6 kHz, the majority occurring in the region of 4 kHz. Notch frequency and depth are highly correlated between left and right ears. Audiogram shape is examined by reference to deviations from a normalized shape which takes care of the individual ages and noise exposures. These deviations differ widely between subjects but are highly correlated between left and right ears at each frequency. No consistent pattern is found that relates to age or to the type of noise. The shape characteristics statistics can assist in establishing limits within which an audiogram may be expected to lie in cases of hearing loss due to noise that are not confounded with other causes. Author (ESA)

**N84-30695#** Franklin Research Center, Philadelphia, Pa.  
**CHRONIC EFFECTS OF REPEATED MECHANICAL TRAUMA TO THE SKIN: A DESCRIPTION OF THE PROBLEM IN THE WORKPLACE**

P. SILVER, R. MASON, and G. HAGEN 1983 115 p refs (Contract PHS-NIOSH-210-81-6001)

(PB84-181767) Avail: NTIS HC A06/MF A01 CSCL 06E

The world medical literature was reviewed and analyzed to determine the long range medical and economic impacts of repeated mechanical trauma to the skin occurring within the workplace. Specific objectives were to determine the populations at risk by identifying the job tasks and other workplace factors associated with repeated mechanical skin trauma; the kinds of injuries that occur, the anatomic sites involved; an estimate of the number of workers affected in various industries and the workplace in general; and an estimate of direct costs based on lost workdays and reimbursements through workman's compensation and other insurance systems. Findings in these areas have led to recommendations for future research. Author (GRA)

## BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

**A84-40703**

**OPERATIONAL METHOD FOR ASSESSING THE PSYCHIC STATE OF ATHLETES [OPERATIVNAIA METODIKA OTSENKI PSIKHICHESKOGO SOSTOIANIIA SPORTSMENOV]**

O. H. MAZUROV and A. S. KORNEEV (Leningradskii Gosudarstvennyi Institut Fizicheskoi Kul'tury, Leningrad, USSR) Teoriia i Praktika Fizicheskoi Kul'tury (ISSN 0040-3601), Jan. 1984, p. 5-7. In Russian. refs

**A84-40708**

**THE EFFECT OF PERSONALITY SETS ON THE PERCEPTION OF OTHER PERSONS [VLIANIE USTANOVOK LICHNOSTI NA VOSPRIYATIE DRUGOGO CHELOVEKA]**

S. I. KURIACHII (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Voprosy Psikhologii (ISSN 0042-8841), Nov.-Dec. 1983, p. 105-108. In Russian. refs

A theory is elaborated according to which the perception of other persons is assumed to be controlled by sets of two levels, pertaining to meaning and operations. Meaning sets determine the actualization of operational sets, suppressing those which do not correspond to them. Reported herein is an experimental study in which school children were asked to perceive pictures of familiar and unfamiliar teachers. The influence of both types of sets was manifested: whenever meanings were actualized in the process of the perception of others, they determined the specificity of perception. In particular, they subordinated the images being formed to themselves and distorted them irrespective of the objective characteristics of the perceived personality. B.J.

**A84-40762**

**HUMAN PERFORMANCE IN MONITORING AND CONTROLLING HIERARCHICAL LARGE-SCALE SYSTEMS**

R. L. HENNEMAN and W. B. ROUSE (Georgia Institute of Technology, Atlanta, GA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-14, Mar.-Apr. 1984, p. 184-191. refs

(Contract MDA903-82-C-0145)

Human performance in monitoring and controlling activities in a hierarchical large-scale network, such as a communications system, is considered. A scenario is described that is used in an experiment to examine three factors affecting humans functioning as network supervisor: cluster size (number of elements per display page), number of levels of pages in the hierarchy, and failure rate per element. It is indicated by the results that increasing cluster size improves performance, increasing number of levels degrades performance, and failure rate affects only subjects' strategies.

Author

**A84-40765**

**AN ENGINEERING APPROACH TO DETERMINING VISUAL INFORMATION REQUIREMENTS FOR FLIGHT CONTROL TASKS**

R. A. HESS (California, University, Davis, CA) and A. A. BECKMAN (Southern Colorado, University, Pueblo, CO) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-14, Mar.-Apr. 1984, p. 286-298. refs

An experimental and analytical investigation of visual information requirements for a simplified, multiloop flight control task was undertaken. The task required the pilot to follow a commanded groundtrack in a simulated aircraft disturbed in roll attitude by random turbulence. Only lateral control was investigated. The main experimental variable was the amount of information given to the pilot via a CRT display. Two display conditions were utilized: one presenting roll attitude and groundtrack error, and a second presenting roll attitude and groundtrack error, and heading

information. Root-mean-square (RMS) performance, as well as pilot transfer functions, were measured for six test subjects. Experimental evidence suggesting innerloop pursuit behavior on the part of one of the subjects is discussed. Analytical pilot modeling of compensatory behavior was undertaken with a simplified optimal control model. Flight director laws and fundamental visual information requirements were seen to evolve naturally with the classical, loop-by-loop closure technique used in formulating the simplified optimal control model. Author

**A84-40899**

**AN EFFORT TO PREDICT THE SUCCESS OF STUDENT-PILOT TRAINING [OPYT PROGNOZIROVANIIA USPESHNOSTI LETNOGO OBUCHENIIA KURSANTOV]**

V. L. MARISHCHUK, O. N. KUZNETSOV, and V. I. EVDOKIMOV  
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1984, p. 45-47. In Russian.

It is shown that the thematic apperception test (TAT) can be used to identify many professionally significant personality traits of future pilots. The information obtained is shown to be effective in predicting the degree of pilot-training success. It is concluded that the proposed version of TAT, when combined with other experimental-psychology methods, helps to reach correct flight-medical solutions; in some cases, TAT is the sole means by which significant experiences of the pilot can be elucidated. B.J.

**A84-41052**

**THE EFFECTS OF STRESS ON PROCESSING ABSTRACT INFORMATION**

J. M. KOONCE and M. L. MOROZE (Massachusetts, University, Amherst, MA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 9-11. refs

The application of recent technological advances to aircraft cockpit display of flight information has resulted in a variety of displays lacking standardization. The level of abstractness of some flight parameters displayed, especially in head-up displays (HUDs), seems to increase pilot workload by requiring additional steps to obtain meaningful flight information. This paper questions the use of abstract symbology in flight displays, especially in vehicles in which the operators may encounter high levels of workload or mental stress, and briefly reviews an on-going research program in this area. Author

**A84-41054\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**THE PILOT'S ROLE IN MANNED SPACE FLIGHT**

W. J. NORTH (NASA, Johnson Space Center, Flight Operation Directorate, Houston, TX) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 29-38.

The present investigation regarding the pilot's role in manned space flight takes into account space missions conducted with the Mercury capsule, Gemini, Apollo, Skylab, and the Shuttle. It is concluded that advancements in digital systems and automation technology have made many of the space pilot's tasks easier. However, these advancements have also made the space pilot's training more complicated. He must be familiar with the interrelated failure effects in highly complex vehicle systems. The nominal performance of the Shuttle fly-by-wire entry control system depends, for instance, on nominal electrical power from three fuel cells, nominal performance of three hydraulic auxiliary power units, five computers, other equipment, and microwave landing systems. The pilot must monitor and manage failures in these systems, and, in addition, must be prepared to intervene if an abort situation creates off-nominal conditions. G.R.

**A84-41067**

**TRAINING FOR AUTOMATICS**

R. E. NORMAN, JR. (Air Line Pilots Association International, Washington, DC) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 161-164. refs

This paper discusses improved concepts which will be required for training and demonstration of performance with new and evolving automated aircraft systems. Computer-based training devices, as well as procedures trainers, will be used to teach the required skills and procedures. Proper training will be demonstrated by simulator performance, primarily through the use of Line Oriented Flight Training (LOFT) scenarios. Author

**A84-41070**

**INFORMATION TRANSFER AND THE CHANGING ROLE OF THE PILOT**

G. L. BABCOCK, W. W. EDMUNDS, JR., and R. B. STONE (Air Line Pilots Association International, Washington, DC) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 183-187. refs

This paper discusses information transfer as it relates to the man-machine interface of future air transports. The term 'information transfer' is defined and related to actual incidents and accidents. Finally, a course of action is proposed to design appropriate roles for the crew and automatics so that optimum information transfer takes place. Author

**A84-41076**

**THE FAA AIR TRAFFIC CONTROLLER TRAINING PROGRAM WITH EMPHASIS ON STUDENT ASSESSMENT**

J. O. BOONE (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 249-255. refs

Several recent incidents involving human safety in the operation of high technology equipment had led to a renewed interest in human factors in high technology, particularly in the selection and training of operating personnel. This paper describes a long term research effort by the FAA in the selection and training of personnel in the high technology air traffic control specialist occupation. The studies demonstrate that better selection and training of air traffic control specialists resulted in a cost-effective means to enhance human safety by producing more competent high technology air traffic personnel. These studies are generalized to other high technology industries where human safety is a prime concern. Author

**A84-41081**

**THE PRIME MENTAL STATE IN FLIGHT OPERATIONS**

J. E. CRANE IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 301-324.

Factors which affect the achievement of the prime mental state in flight operations are discussed. Thinking is examined in detail in terms of memory, flash memory, short and long term memory, judgment, and brain malfunction. Feeling and movement are briefly considered. Body electricity and chemistry are addressed, emphasizing the importance of epilepsy. Variations in consciousness are discussed in detail, including the effect of jet lag and flight fatigue, speed, time, flying direction, excessive heat or cold, psychological disruption, atmospheric phenomena, dehydration, drugs, atmospheric ozone, air ionization, light, radiation, and diet. C.D.



A84-41231

**PROBLEMS IN THE SELECTION AND TRAINING OF F 16 PILOTS FOR THE BELGIAN AIR FORCE [PROBLEMES DE SELECTION ET D'ENTRAINEMENT DU PERSONNEL NAVIGANT SUR F 16 /FORCES AERIENNES BELGES/]**

MR. VANDENBOSCH (Force Aeriennes Belges, Brussels, Belgium) (Journée de Médecine Aeronautique de la Force Aérienne Tactique, Metz, France, Nov. 4, 1983) Médecine Aeronautique et Spatiale, vol. 23, 2nd Quarter, 1984, p. 156-161. In French. refs

Belgian military pilots have, since 1979, been flying the F 16 fighter instead of F 104s, and are now required to undergo annual cardiologic and spiroergonomic examinations. The new medical tests are designed to reveal the onset of pathological conditions caused by the high intensity, prolonged accelerations experienced in flying F 16s. The results of physical examinations of the first 70 pilot candidates and a review of centrifuge tests results in the U.S. led to construction of exercise rooms for the pilots. Isometric and weight-lifting apparatus are available as a means to increased endurance through increases in aerobic conditioning and muscular development. M.S.K.

A84-41550

**A GROUP-THEORETICAL APPROACH TO PERCEPTION - RETROSPECTIVE VIEW AND CURRENT STATUS [TEORETIKO-GRUPPOVOI PODKHOD K VOSPRIIATIIU - RETROSPEKTIVA I SOVREMENNOE SOSTOIANIE]**

I. M. SOKOLOV (Gor'kovskii Gosudarstvennyi Pedagogicheskii Institut, Gorki, USSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 114-127. In Russian. refs

A theoretical analysis is made of the application of group theory to the study of visual space perception. Classical approaches to the definition of the psychological status of the concept of a group are described, and attention is given to attempts to solve the problems of Poincaré. Consideration is also given to the application of group theory to the neurophysiology of perception, the theory of psychophysical scaling, and the problem of size-distance invariance. Conclusions about the existence of direct and reverse transformations of perception are discussed, and the potential of group theory for unifying psychophysiological, physiological, and psychophysical models of perception is considered. I.H.

A84-41551

**IS MEMORY A UNITARY PROCESS? [EDINA LI PAMIAT'?)**

N. N. KORZH (Akademiia Nauk SSSR, Institut Psikhologii, USSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 103-111. In Russian. refs

Memory is considered as a unitary process with an instantaneous-fixation mechanism, and it is noted that this process is characterized by the properties of dynamicity, accuracy, and stability. Attention is given to theoretical considerations and experimental data pertaining to forgetting in relation to interference and decay; the relationship between memory and sensory-perception tasks; and the trace-fixation mechanism on the neurophysiological level. B.J.

A84-41552

**THE PERCEPTION OF BINAURAL TEMPORAL SHIFTS [VOSPRIIATIE BINAURAL'NYKH VREMENNYKH SDVIGOV]**

A. A. TEREPING (Estonskii Respublikanskii Radioteletsentr, Estonian SSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 79-84. In Russian. refs

A study was conducted to examine differences in thresholds of perception of binaural phase shifts under different experimental conditions as well as to estimate anomalies in the distribution of threshold values. It is concluded that it is necessary to differentiate binaural phase shifts from binaural temporal shifts of the entire signal. B.J.

A84-41554

**REACTION OF THE HEART RATE TO INFORMATION LOAD [REAKTSII SERDECHNOGO RITMA NA INFORMATSIONNIU NAGRUZKU]**

E. N. SOKOLOV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) and A. I. STANKUS Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 55-61. In Russian. refs

Results of an experiment are reported which investigated the reaction of the heart rates of 20 healthy subjects to different information loads. Subjects were given a series of randomly arranged sounds with different frequencies and each subject was required to identify the standard sound frequency of 1000 Hz. Intensity of the information was defined by the probability of the occurrence of the standard sound and by the addition of new sounds nearer and nearer to the standard frequency. With the increased tone in the background of the parasympathetic control, reactions were found to decrease, and for the decreased tone, the increased information load was accompanied by adaptational restoration of the HR rate. I.H.

A84-41555

**PSYCHOLOGY AND THE STUDY OF 'HUMAN FACTORS' IN MANAGEMENT [PSIKHOLOGIIA I IZUCHENIE 'CHELOVECHESKOGO FAKTORA' V UPRAVLENII]**

A. V. FILIPPOV (Moskovskii Institut Upravleniia, Moscow, USSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 35-44. In Russian. refs

A84-41556

**ACHIEVEMENTS AND TASKS OF MEMORY RESEARCH AT THE PRESENT STAGE [ITOGI I ZADACHI ISSLEDOVANIIA PAMIATI NA SOVREMENNOM ETAPE]**

S. P. BOCHAROVA (Khar'kovskii Pedagogicheskii Institut, Kharkov, Ukrainian SSR) Psikhologicheskii Zhurnal (ISSN 0033-2941), vol. 5, Jan.-Feb. 1984, p. 18-25. In Russian. refs

The history of the development of a psychological theory of memory is reviewed. Attention is given to contributions of Soviet and foreign scientists to the solution of fundamental problems of memory research. Research presented at the VI Congress of the USSR Society of psychologists is discussed, and recommendations are made with regard to the content of future studies. I.H.

A84-41567

**BASIC CONDITIONS OF INTERPERSONAL UNDERSTANDING DURING JOINT ACTIVITY [OSNOVNYE USLOVIA MEZHlichnostNOGO PONIMANIIA V SOVMESTNOI DEIATEL'NOSTI]**

V. V. ZNAKOV Voprosy Psikhologii (ISSN 0042-8841), Jan.-Feb. 1984, p. 138-141. In Russian. refs

A84-41568

**DECISION MAKING AS A PROBLEM IN THE PSYCHOLOGY OF COGNITION [PRINIATIE RESHENII KAK PROBLEMA PSIKHOLOGII POZNANIIA]**

L. L. GUROVA (Akademiia Pedagogicheskikh Nauk SSSR, Moscow, USSR) Voprosy Psikhologii (ISSN 0042-8841), Jan.-Feb. 1984, p. 125-132. In Russian. refs

A84-41570

**INDIVIDUAL DIFFERENCES IN REACTIONS TO INDIFFERENT AND UNPLEASANT STIMULAE [INDIVIDUAL'NYE RAZLICHIIA V REAKTSIIAKH NA INDIFFERENTNYE I NEPRIIATNYE STIMULY]**

E. M. RUTMAN, B. I. KOCHUBEI (Akademiia Pedagogicheskikh Nauk, Moscow, USSR), and I. U. N. SHEVAREV (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Tsitologii i Genetiki, Novosibirsk, USSR) Voprosy Psikhologii (ISSN 0042-8841), Jan.-Feb. 1984, p. 95-101. In Russian. refs

Measurements of galvanic skin response, evoked potential, EKG, and winking in response to repeated tones of 80 and 105 dB are reported. It is found that the 80 dB tone provoked an orientation reaction while the 105 dB tone provoked a defense reaction. The defense reaction was characterized by prolonged

habituation in a number of indices. It is suggested that there may be a compensatory psychophysiological mechanism which is active or inactive in direct relation to the strength of the defense reaction. I.H.

**A84-41571**

**SOCIAL-PERCEPTUAL PROCESSES OF GROUP DECISION MAKING [SOTSIAL'NO-PERTSEPTIVNYE PROTSESSY V USLOVIAKH GRUPPOVOGO PRINIATIIA RESHENII]**

A. G. KOSTINSKAIA Voprosy Psikhologii (ISSN 0042-8841), Jan.-Feb. 1984, p. 75-80. In Russian. refs

The degree of group polarization in making a decision concerning the difficulty of a task to be performed is found to correlate negatively with the efficiency of the group. The degree of polarization is also found to depend directly on the ability of self-evaluation within the group, and is connected positively with the ability to understand the structure and workings of the leadership in the group. Group efficiency is therefore found to be a combined effect of both social-perceptual phenomena and of the proper differentiation of various roles within the group under decision making conditions. I.H.

**N84-29456\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**UNIFORM APPARENT CONTRAST NOISE: A PICTURE OF THE NOISE OF THE VISUAL CONTRAST DETECTION SYSTEM**

A. J. AHUMADA, JR. and A. B. WATSON Jul. 1984 25 p (NASA-TM-85867; A-9574; NAS 1.15:85867) Avail: NTIS HC A02/MF A01 CSCL 05J

A picture which is a sample of random contrast noise is generated. The noise amplitude spectrum in each region of the picture is inversely proportional to spatial frequency contrast sensitivity for that region, assuming the observer fixates the center of the picture and is the appropriate distance from it. In this case, the picture appears to have approximately the same contrast everywhere. To the extent that contrast detection thresholds are determined by visual system noise, this picture can be regarded as a picture of the noise of that system. There is evidence that, at different eccentricities, contrast sensitivity functions differ only by a magnification factor. The picture was generated by filtering a sample of white noise with a filter whose frequency response is inversely proportional to foveal contrast sensitivity. It was then stretched by a space-varying magnification function. The picture summarizes a noise linear model of detection and discrimination of contrast signals by referring the model noise to the input picture domain. Author

**N84-29457\*#** Johns Hopkins Univ., Baltimore, Md. Dept. of Psychiatry.

**BEHAVIORAL AND BIOLOGICAL EFFECTS OF CHANGES IN GROUP SIZE AND MEMBERSHIP**

H. H. EMURIAN, J. V. BRADY, R. L. RAY, J. L. MEYERHOFF, and E. H. MOUGEY 1 Jun. 1984 137 p (Contract NGR-21-001-111; N00014-80-C-0467) (NASA-CR-173801; NAS 1.26:173801; AD-A141561; TR-ONR-10) Avail: NTIS HC A07/MF A01 CSCL 05J

Groups performing complex tasks under operational conditions can be anticipated to undergo changes in size and membership. Accordingly, the present research project developed a paradigm for investigating effects of such membership turbulence with 2-person and 3-person groups residing in a programmed laboratory environment for 10 successive days. A range of mission parameters (e.g., performance tasks, motivation, group member composition, social interaction opportunities, etc.) was systematically explored during 10 studies that included 6 analyses of changes in group size and 4 analyses of changes in group membership. The resulting database provides the opportunity for inductive determinants of interrelationships among performance, behavioral, and endocrine effects that were assessed throughout each of the 10 group investigations. GRA

**N84-29458#** Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.

**NONLABORATORY TECHNIQUES FOR THE STUDY OF COGNITIVE AND DECISION-MAKING PROCESSES: A DESCRIPTION AND SELECTED BIBLIOGRAPHY**

J. HALL and R. H. PHELPS Dec. 1983 34 p (Contract DA PROJ. 2Q2-63739-A-793) (AD-A141732; ARI-RN-83-45) Avail: NTIS HC A03/MF A01 CSCL 05J

This technical report describes nonlaboratory research methods that can be adapted to examine covert cognitive and decision-making processes underlying the performance of a task. These techniques generally can be applied in the natural task setting with a minimum of interference and disruption of task performance. Summarized are nine methods classified under three main categories: process-tracing methods, applied research methods, and field research methods. In addition to a full description of each method, major references and selected annotations are included. While most of these methods traditionally have not been used to study cognition, suggestions for their adaptation to cognitive applications are provided. GRA

**N84-29459#** New Mexico State Univ., Las Cruces. Dept. of Psychology.

**COGNITIVE ORGANIZATION AS A FUNCTION OF FLYING EXPERIENCE Final Report**

R. W. SCHVANEVELDT, T. J. BREEN, N. M. COOKE, F. T. DURSO, T. E. GOLDSMITH, R. G. TUCKER, and J. C. DEMAIO Brooks AFB, Tex. AFHRL May 1984 51 p (Contract F33615-80-C-0004; AF PROJ. 2313) (AD-A141767; AFHRL-TP-83-64) Avail: NTIS HC A04/MF A01 CSCL 05J

This report reviews work in defining and measuring conceptual structures of critical flight information in Air Force fighter pilots. Groups of pilots with widely varying expertise were tested. Cognitive structures were defined by multidimensional scaling (MDS) and general weighted networks (GWN). The structures were validated by recovering the experience differences among the pilots from their conceptual structures. Group membership can be predicted from a person's conceptual structure. The techniques employed permit detailed analyses of individual differences, and they point to factors distinguishing expert and novice pilots. The GWN analysis led to the identification of specific points of agreement and disagreement in the conceptual organization of novice and expert pilots. Pilots do have measurable cognitive structures for organizing flight-related information. These structures are measurably different for individuals with differing flight experience. The techniques used here produce descriptions of conceptual structure that may have application in training and assessing individual differences in the development of expert conceptual structures. GRA

**N84-29460#** Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.

**SYMBOLIC KNOWLEDGE PROCESSING FOR THE ACQUISITION OF EXPERT BEHAVIOR: A STUDY IN MEDICINE Interim Technical Report**

A. T. RAPPAPORT and J. M. C. CHAUVET May 1984 50 p (AD-A141835; CMU-RI-TR-84-8) Avail: NTIS HC A03/MF A01 CSCL 09D

This research is concerned with the simulation of learning by experience to induce the capability for a knowledge-based system to pre-structure the problem before solving it. The model we present is made of different consecutive modules accounting for the tasks of problem solving, building a dynamic memory and extracting expectations, and pre-structuring or pre-solving the problem. The problem-solver yields internal representation of the problems between which symbolic distances may be defined. The latter are then processed to build the dynamic memory. We used the formalization of medical problem-solving as an example, studying how successive evaluations of cases may lead to the acquisition of the capability to generate an accurate set of initial hypotheses: an expert behavior. The knowledge base is not modified, neither are the strategies in the present implementation. To the data

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gathering about the patient's complaints is added a concept-driven process by which the system asks for specific data representative of the past experience. The results show that such a system, evolving in a coherent reality increases its qualitative behavior by initially focusing on the right hypotheses or goals. This improvement is induced by the exposure to new situations. Moreover, situations once or rarely encountered are efficiently recognized when re-occurring later. GRA

**N84-29461#** Texas A&M Univ., College Station. Dept. of Management.

### **EFFECTS OF CONFIRMED AND DISCONFIRMED EXPECTATIONS: A NATURALLY OCCURRING EXPERIMENT**

J. E. SKIVINGTON and R. W. WOODMAN May 1984 42 p  
(AD-A141857; TR-ONR-6) Avail: NTIS HC A03/MF A01 CSCL 05J

The existence of a naturally occurring event (the selection of students for an honors program) permitted a test of cognitive dissonance theory through falsification. Affective reactions to confirmed and disconfirmed expectations were measured using both quantitative and qualitative approaches. Support for dissonance reduction through affective displacement is discovered but the results raise questions about the predictive ability of cognitive dissonance theory. Methodological issues and attributionally based extensions to dissonance theory are discussed. GRA

**N84-29462#** Illinois Univ., Urbana. Model Based Measurement Lab.

### **A STATISTICAL PROCEDURE FOR ASSESSING TEST DIMENSIONALITY**

W. STOUT 9 Mar. 1984 21 p  
(Contract N00014-79-C-0752; N00014-83-K-0397; RR0-4204)  
(AD-A142179; MEASUREMENT/SER-84-2) Avail: NTIS HC A02/MF A01 CSCL 05J

An important problem in psychological test theory is the development of a sound method for determining whether a test which purports to measure the level of a certain ability is, in reality, significantly contaminated by one or more other abilities displayed by persons taking the test. Because of the large number of private and governmental organizations routinely using tests to screen people for the levels of various abilities, this problem of assessing the dimensionality of a test is of great importance. The solution will be useful in settings other than psychological testing, since the problem is one of general interest and should, hence, be an important addition to statistical methodology literature. Described in this paper is an approach to the problem of finding a theoretically sound and useful procedure for making inferences about the dimensionality of the ability parameter, or more precisely, the dimensionality of the distribution of the ability parameter. GRA

**N84-29463#** Colorado Univ., Boulder. Inst. of Cognitive Science.

### **MODIFICATION OF CURRENT FEEDBACK STRATEGIES: A TEXT SYNTHESIS APPROACH Final Report**

P. LANGER and V. KEENAN Mar. 1984 58 p  
(Contract AF-AFOSR-0149-83)  
(AD-A142187; AFOSR-84-0481TR) Avail: NTIS HC A04/MF A01 CSCL 05J

Two passages, each consisting of a 13 and 19 sentence version, were constructed from the same essay on the development of the atom bomb. The passage sentences are individually typed on index cards, and the four resulting packets were then scrambled. Subjects were undergraduate psychology students at the University of Colorado who received one of the four scrambled orders of sentences. Subjects serially reconstructed the passages using a slotted board. In the feedback condition subjects were given five tokens to determine if a card had been appropriately placed. The no-feedback students did not receive any assistance in determining the correctness of placement. In both conditions subjects signalled when they thought they were through. The dependent measures were time (in minutes), number of moves, concordance with the

author's original order of sentences, percentage recall (the number of idea units recalled), and percentage recognition (choosing the original sentence from a pair containing a paraphrase. The recall and recognition measures were given directly after completion of the task. The independent variables were feedback/no-feedback, content, and number of sentences. GRA

**N84-30696#** Advanced Research Resources Organization, Silver Spring, Md.

### **ANALYSIS OF COMPUTER INTERACTIVE TESTS FOR ASSIGNING HELICOPTER PILOTS TO DIFFERENT MISSIONS Research Note, 2 Nov, 1981 - 2 May 1983**

D. C. MYERS, F. M. SCHEMMER, and E. A. FLEISHMAN Jun. 1984 58 p  
(Contract DA PROJ. 2Q2-63731-A-792)  
(AD-A142434; ARI-RN-84-87) Avail: NTIS HC A04/MF A01 CSCL 05I

A test battery was developed to represent a broad range of abilities and skills that were identified as important in piloting helicopters. The battery was developed on the basis of a taxonomic approach to job analysis which linked pilot tasks to ability requirements for different mission tracks. The tests developed were based on an earlier review, by ARRO staff, of the kinds of tests likely to measure the abilities identified in the job analysis approach employed. The present study included the development, programming and pre-testing of computer interactive tests designed to measure abilities identified as underlying critical tasks in the various helicopter missions. Optimum conditions of administration were developed and test reliability was determined. Tasks judged by expert pilots to be critical for pilot effectiveness were identified as possible measures of performance in the different mission tracks. These tasks can be translated into criterion measures and used in validating the test battery developed. The purpose of the validation will be to empirically link test scores with performance in these critical tasks representing the different mission tracks. The findings would indicate if all the tests are needed or if empirical validities showed which limited set of tests can be used to predict mission performance. Author (GRA)

**N84-30697#** Navy Personnel Research and Development Center, San Diego, Calif.

### **BIOMAGNETISM: POSSIBLE NEW PREDICTOR OF PERSONNEL PERFORMANCE Interim Report, FY 1982 - 1983**

G. W. LEWIS and M. R. BLACKBURN Jun. 1984 36 p  
(Contract B99-QAXR)  
(AD-A142451; NPRDC-TR-84-43) Avail: NTIS HC A03/MF A01 CSCL 05I

The objective of this effort was to determine whether biomagnetic recordings may prove effective in predicting personnel performance. Two experiments were conducted. In the first, bioelectric data (e.g., event-related brain potentials) and sample biomagnetic data (e.g., event-related fields) obtained from one individual were compared. Results suggest that biomagnetic recordings are more sensitive to biological activity localization than are bioelectric recordings. In the second experiment, multiple serial recordings of visually evoked magnetic fields were taken on five people to obtain waveform topographic maps from the occipital and parietal brain regions. Waveform reliability was determined by signal averaging techniques and by examination of characteristic changes in waveform shape over the maps in comparison to background magnetic noise. The visually evoked field was found to be a multiphasic waveform composed of a short period sinusoidal deflection after about 200 msec. The waveform was observed in both the occipital and parietal regions lateral to the midline. Phase reversals of major deflections occurred between the left and right hemispheres and between the occipital and parietal regions of the right but not left hemisphere. The reliability of the visually evoked field components between 100 and 200 msec. should be adequate for their further use as a predictor of performance. GRA

**N84-30698#** Federal Aviation Administration, Atlantic City, N.J.  
**THE MEASUREMENT OF PILOT PERFORMANCE: A MASTER-JOURNEYMAN APPROACH** Final Report  
 E. S. STEIN May 1984 113 p  
 (AD-A142457; FAA/CT-83/15) Avail: NTIS HC A06/MF A01  
 CSCL 05J

This project evaluated several methods for measuring pilot performance in a general aviation simulator and examined the relationship between performance and workload. An Automated Performance Measurement (APM) System was designed for use in a flight simulator which was instrumented for digital data collection. Performance rating was accomplished by three independent observers. Workload was assessed using a real-time subjective input system with which pilots provided workload estimates every minute. Two groups of pilots participated in the experiment: ten professional high-time pilots and ten recently qualified instrument pilots. Both the APM and the observer ratings showed significant performance differences between the two pilot groups. The automated technique showed more of a spread, however, among individuals in the professional (masters) group. The newly qualified pilots (journeymen) reported significantly higher workload than their masters counterparts and their performance was significantly worse. Author (GRA)

**N84-30699#** Educational Testing Service, Princeton, N. J.  
**SPECULATIONS ON THE FUTURE OF TEST DESIGN**  
 I. I. BEJAR Apr. 1984 45 p  
 (Contract N00014-83-C-0761; RR0-4204)  
 (AD-A142662; ETS-RR-84-13-ONR) Avail: NTIS HC A03/MF A01 CSCL 05J

The paper discusses the potential benefits of integrating technology, cognitive science, and psychometric theory. It is argued that even though adaptive testing, as currently implemented, is an important achievement, it will be necessary to pay close attention to the psychological foundation of tests to continue advancing the state of the art. Such an effort requires construct validation in the broadest sense, as well as focusing on items and why they differ with respect to psychometric parameters, especially difficulty. This approach opens the possibility of generating items with better control of their psychometric characteristics and ultimately the development of computer-based tests that are solidly anchored in psychological theory. Author (GRA)

**N84-30700#** Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.  
**A REVIEW OF THE LITERATURE ON TRAINING SIMULATORS. TRANSFERORS: TRANSFER OF TRAINING AND SIMULATOR FIDELITY** Technical Report, 1 Jun. 1982 - 31 May 1985  
 Y. L. D. SU Apr. 1984 83 p  
 (Contract N00014-82-K-0487)  
 (AD-A142732; GIT-TR-84-1) Avail: NTIS HC A05/MF A01  
 CSCL 05J

This report summarizes and evaluates a number of transfer of training methodologies. Definitions and components of simulator fidelity are discussed. The issue of fidelity measurements is investigated and the relationship between fidelity and training effectiveness is explored. Author (GRA)

**N84-30701#** Trenton State Coll., N. J.  
**THE REPRESENTATION OF PART-WHOLE INFORMATION IN MEMORY** Final Report  
 R. CHAFFIN Jun. 1983 14 p  
 (Contract PHS MH-36533)  
 (PB84-180140; NIMH-83-403) Avail: NTIS HC A02/MF A01  
 CSCL 05J

This report discusses the part whole relation, the representation of information about parts of objects in memory, and decision processes used to decide whether one thing is part of another were studied. A taxonomy of various kinds of part whole relations, e.g., club member, mile yard, salt grain, car wheel is developed and part whole from other inclusion relations such as class inclusion was distinguished. The organization of parts of objects in memory in a copartonym judgment task is presented. Also, the processes

involved in deciding that one object is part of another is explored. GRA

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## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

**A84-40344**  
**A TRANSIENT MODEL OF THERMOREGULATION IN A CLOTHED HUMAN**  
 P. SMITH (Sunderland Polytechnic, Sunderland, England) and E. H. TWIZELL (Brunel University, Uxbridge, Middx., England) Applied Mathematical Modelling (ISSN 0307-904X), vol. 8, June 1984, p. 211-216. refs

This paper describes a mathematical model of human thermoregulation in a clothed individual. Heat flow within and from the clothed body is expressed as a system of partial differential equations. The system is nonlinear as a result of the very nature of human thermoregulation. Such important physical properties as shivering, sweating, vasodilation and vasoconstriction are included in the simulation. Finite difference techniques are used to approximate spatial partial derivatives, thus reducing the problem to that of solving a system of nonlinear ordinary differential equations. A high accuracy approximation in the time dimension is used to generate a solution to the problem. The model is used to predict the reaction of a clothed human to various changes in environmental conditions. Author

**A84-40602**  
**AREA OF INTEREST DISPLAYS IN VISUAL SIMULATION**  
 A. M. SPOONER (U.S. Navy, Naval Training Equipment Center, Orlando, FL) IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IB-1 to IB-12. refs

It is pointed out that simulation of the pilot's view through the windows has been available for training and research over the last twenty years for aircraft and for space vehicles. The Shuttle Mission Simulator uses exclusively a computer image generation (CIG) procedure. This technique is now employed universally by the airlines and almost exclusively for military simulation. Aspects of visual simulation for aircraft are discussed. The number of displays and CIG channels required depends on the total displayed field of view (FOV) needed. Any display in which at least part of the FOV is not fixed in direction relative to the aircraft windows is referred to as an area of interest (AOI). The control of the movement of the FOV with respect to the aircraft windows to create an AOI display is considered. The FOV may move with or track a displayed target, the pilot's head, the pilot's eyes, and a combination of these. G.R.

**A84-40605**  
**WORKLOAD ASSESSMENT OF A TRAJECTORY GUIDANCE DISPLAY**  
 B. A. BERNABE (Florida Institute of Technology, Melbourne, FL) IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IB-37 to IB-50.

The present study evaluated the utility of a Flight Test Trajectory controller, a special purpose display, in improving pilot performance and reducing workload during difficult test maneuvers. Algorithmic controlled indicators presented focally and in an integrated manner, information about pitch and roll stick control and Mach error. The display thus functioned as a flight guidance system, with the pilot's task being to reduce the error signal. In two simulated maneuvers,

performance, as measured by time to achieve condition and elapsed time on condition, was facilitated by the trajectory controller when compared with performance using conventional instrumentation. In addition, pilot workload, measured by performance on two secondary tasks was significantly reduced in the trajectory display condition. Author

### A84-40632

#### DESIGN OF MICROGRAVITY SPACE ENVIRONMENTS TO ENHANCE CREW HEALTH, MORALE, AND PRODUCTIVITY

L. BELL (Houston, University, Houston, TX) IN: Space - The next twenty years; Proceedings of the Twentieth Space Congress, Cocoa Beach, FL, April 26-28, 1983. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1984, p. IIC-1 to IIC-14.

This paper discusses habitability issues and design concepts which apply to large and small space stations. Special emphasis is placed upon opportunities and constraints posed by microgravity and upon special problems and needs associated with long-term isolation under confined conditions. Design concepts are illustrated through photographs of drawings and models. Types of functional areas addressed include crew quarters, food preparation/dining areas, work areas, and exercise/recreation facilities. Author

### A84-41051

#### BEHAVIORAL OBJECTIVES IN AVIATION AUTOMATED SYSTEMS SYMPOSIUM; PROCEEDINGS OF THE AEROSPACE CONGRESS AND EXPOSITION, ANAHEIM, CA, OCTOBER 25-28, 1982

Congress and Exposition sponsored by the Society of Automotive Engineers. Warrendale, PA, Society of Automotive Engineers, Inc. (SAE Proceedings P-114), 1982, 383 p.

The subjects discussed are related to human information processing, man and automation in space flight, the design and testing of advanced commercial transport cockpits, current and advanced displays, the airline pilot's role in automation, operating experience in cockpit automation, and the modernization of the national airspace system. The role of the computer in the control of an aircraft is considered along with the effect of automation on air safety analysis and certification, the prime mental state in flight operations, and roles of the man in space in the future. Attention is given to 'personal integrity' and man-machine integration, the effects of stress on processing abstract information, the distribution of man-machine controls in space teleoperation, a space transportation system payload flight data file, the role of pilots and automation in future transport flight stations, and the pilot and the flight management system. G.R.

A84-41053\* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### DISTRIBUTION OF MAN-MACHINE CONTROLS IN SPACE TELEOPERATION

A. K. BEJCZY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 15-27. refs

(Contract NAS7-100)

The distribution of control between man and machine is dependent on the tasks, available technology, human performance characteristics and control goals. This dependency has very specific projections on systems designed for teleoperation in space. This paper gives a brief outline of the space-related issues and presents the results of advanced teleoperator research and development at the Jet Propulsion Laboratory (JPL). The research and development work includes smart sensors, flexible computer controls and intelligent man-machine interface devices in the area of visual displays and kinesthetic man-machine coupling in remote control of manipulators. Some of the development results have been tested at the Johnson Space Center (JSC) using the simulated full-scale Shuttle Remote Manipulator System (RMS). The research and development work for advanced space teleoperation is far

from complete and poses many interdisciplinary challenges.

Author

A84-41055\* National Aeronautics and Space Administration, Washington, D. C.

#### HUMAN FACTORS TECHNOLOGY FOR AMERICA'S SPACE PROGRAM

M. D. MONTEMERLO (NASA, Washington, DC) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 39-47. refs

NASA is initiating a space human factors research and technology development program in October 1982. The impetus for this program stems from: the frequent and economical access to space provided by the Shuttle, the advances in control and display hardware/software made possible through the recent explosion in microelectronics technology, heightened interest in a space station, heightened interest by the military in space operations, and the fact that the technology for long duration stay times for man in space has received relatively little attention since the Apollo and Skylab missions. The rationale for and issues in the five thrusts of the new program are described. The main thrusts are: basic methodology, crew station design, ground control/operations, teleoperations and extra vehicular activity.

Author

### A84-41056

#### SPACE SHUTTLE CREW STATION REQUIREMENTS - PAST AND FUTURE

J. A. ROEBUCK, JR. (Rockwell International Corp., Pittsburgh, PA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 49-60.

The flight deck of the Space Shuttle orbiter was strongly influenced by traditional transport aircraft concepts as well as by newer concepts such as all-electronic, computer-aided controls and time-shared CRT displays. This paper discusses crewmembers' reach and vision interactions with control and display interfaces in relation to automation concepts of the piloting, manipulator, berthing, and payload handling stations. Three critical stages of flight (boost, docking and berthing, and descent) are emphasized as key issues in the design of crew stations. The pilot's role during ascent is mainly one of monitoring a computer-controlled vehicle. Descent permits a choice of automated or manual control for energy management of a high-speed aerodynamic glider. On-orbit operations include berthing, docking, and handling of payloads with a computer-aided remote manipulator system (RMS). Future use of the RMS may call for the addition of force sensors, proximity sensors, and automatic homing devices to enhance productivity. Author

### A84-41060

#### THE PILOT AND THE FLIGHT MANAGEMENT SYSTEM

J. R. GANNETT (Boeing Co., Seattle, WA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 93-96. refs

The present investigation is concerned with questions regarding the most suitable role of automation in aviation systems, taking into account the objective to provide automation for a maximization of aircraft capabilities and the enhancement of human performance capacity. Attention is given to the proper role of the pilot, details regarding the characteristics of the human pilot, reasons for automating, guidelines for automation applications, automation problems, a brief summary of the application of automatics on the 757/767 aircraft, and areas where current human factors and digital technology should be employed to further increase safety and afford more relief to the flight crew in high workload situations. The latter areas are related to communication, map display, Head Up Display (HUD), and collision avoidance. G.R.

A84-41064

**HUMAN FACTORS CONSIDERATIONS IN THE DEVELOPMENT OF A VOICE WARNING SYSTEM FOR HELICOPTERS**

C. M. BERTONE (United Technologies Corp., Sikorsky Aircraft Div., Stratford, CT) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 133-142. refs

Results of research to determine the messages, priority, and type of voice to be used in a voice warning system for a commercial helicopter (S-76) are reported. The goal of voice warning systems is to permit the pilot to fly 'head-up' for longer periods and to relieve him of the task of monitoring warning displays. Feasibility studies were conducted on the benefits and requirements of warning systems for helicopters, and a human factors study group investigated which noise levels, types of human voices, and order of commands are most effective in warning the pilot of possible hazards without distracting him. The system was tested successfully before being sent on a tour of several European air shows. A number of recommendations are made concerning future improvements in the VWS. I.H.

A84-41073

**EXPERIENCES IN AIDING AIRBORNE DECISION-MAKING**

J. HOPSON (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA) and W. ZACHARY (Analytics, Inc., Willow Grove, PA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 211-224.

This paper describes research aimed at structuring decision augmentation system design by defining, developing, and applying appropriate design techniques for a variety of airborne platforms. The goal of this research is to improve combined man/machine system performance by enhancing the integration of information in the total avionics system. Results from several studies are summarized and related to the systematic design/evaluation approach being advocated. The approach described includes: (1) identifying key decision situations and matching them to available decision augmentation techniques; (2) extracting, organizing, and summarizing experienced operator opinion about problems in unaided information processing tasks; (3) estimating effectiveness of candidate augmentation algorithms through the use of operator models; and (4) estimating the cost of candidate augmentation systems. The methods are discussed using examples from airborne anti-submarine-warfare. Author

A84-41082

**MANNED REMOTE WORK STATIONS - MACHINES TO ENHANCE MAN'S SPACE PRESENCE**

C. A. NATHAN (Grumman Aerospace Corp., Bethpage, NY) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 329-341.

The evolution of the Manned Remote Work Station (MRWS). The MRWS is a series of EVA platforms and crew cabins that perform roles which are common on the ground such as cherry pickers, crane turrets, emergency repair vehicles and short haul transporters. Concepts and their space applications are delineated for near term applications in support of the Space Shuttle and future applications in support of the Space Station. Results of man-in-the-loop simulations that demonstrate man's role in maintaining satellites are also discussed as are test results on the use of manipulators, a key element of the MRWS. Author

A84-41084

**SPACE OPERATIONS CENTER CREW SKILLS AND SCHEDULING**

R. L. OLSON and K. H. MILLER (Boeing Aerospace Co., Seattle, WA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 349-362.

A summary of the Space Operations Center (SOC) crew skill and scheduling analysis is presented in this paper. The analysis was conducted by Boeing Aerospace Company on contract to NASA-Johnson Space Center. Brief descriptions of the SOC design, projected missions, and mission modeling are presented. The analytical approach is outlined as well as the resulting crew skill allocations and projected crew sizes through the year 2000.

Author

A84-41086\* Boeing Aerospace Co., Seattle, Wash.

**AUTOMATION OF CREW PROCEDURES USING MULTIFUNCTION DISPLAY AND CONTROL SYSTEMS**

R. J. SPIGER and M. H. TONKIN (Boeing Aerospace Co., Seattle, WA) IN: Behavioral Objectives in Aviation Automated Systems Symposium; Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 25-28, 1982. Warrendale, PA, Society of Automotive Engineers, Inc., 1982, p. 371-378. (Contract NAS9-16645)

A multifunction display and control system (MFDCS) design concept has been developed for the Orbiter spacecraft. The system provides for automation of crew procedures, fault prioritization, incorporation of checklists and procedures into the display and control system and system flexibility in response to mission variation, increased experience and advancing display and control technology. Hardware included in the system includes a multifunction keyboard using programmable legend switches, a medium size flat panel display for presentation of alphanumeric information and a color CRT for the display of schematic diagrams. The access schema for the multifunction display and control system preserves the single function capability of the present set of dedicated switches while also providing for automation of many of the checklists and procedures. A basic design feature of the system is the ability to change the relative level of automation and crew interaction without modifying the system hardware or basic software operating system. Author

A84-41565

**A RHEOLOGICAL MODEL OF MUSCLE TISSUE IN A STATE OF CONSTANT ACTIVATION [RHEOLOGICHESKAIYA MODEL' MYSHECHNOI TKANI V SOSTOIANII POSTOIANNOI AKTIVATSII]**

E. M. TIMANIN (Akademiia Nauk SSSR, Institut Prikladnoi Fiziki, Gorki, USSR) Biofizika (ISSN 0006-3029), vol. 29, Jan.-Feb. 1984, p. 135-138. In Russian. refs

On the basis of observations of cylindrical samples of muscle tissue in a state of constant activation, a constitutive equation is found which permits a reproduction in the first order of approximation of the frequency relationships of dynamic rigidity and phase shift between tension and deformation of muscle tissue. Some of the implications of the equation are discussed, and they appear to involve a description of the muscle contractile element in terms of its macroscopic characteristics without an elucidation of its inner structure. I.H.

A84-42276\* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**EVALUATION OF RIDE QUALITY PREDICTION METHODS FOR OPERATIONAL MILITARY HELICOPTERS**

J. D. LEATHERWOOD, S. A. CLEVENSON (NASA, Langley Research Center, Hampton, VA), and D. D. HOLLENBAUGH (U.S. Army, Applied Technology Laboratory, Fort Eustis, VA) American Helicopter Society, Journal (ISSN 0002-8711), vol. 29, July 1984, p. 11-18. Previously announced in STAR as N84-20155. refs

The results of a simulator study conducted to compare and validate various ride quality prediction methods for use in assessing



passenger/crew ride comfort within helicopters are presented. Included are results quantifying 35 helicopter pilots' discomfort responses to helicopter interior noise and vibration typical of routine flights, assessment of various ride quality metrics including the NASA ride comfort model, and examination of possible criteria approaches. Results of the study indicated that crew discomfort results from a complex interaction between vibration and interior noise. Overall measures such as weighted or unweighted root-mean-square acceleration level and A-weighted noise level were not good predictors of discomfort. Accurate prediction required a metric incorporating the interactive effects of both noise and vibration. The best metric for predicting crew comfort to the combined noise and vibration environment was the NASA discomfort index. Author

#### A84-42575

##### DEEP DIVING SIMULATOR TITAN [TIEFSTAUCHSIMULATOR TITAN]

H. D. FUST (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany) DFLR-Nachrichten (ISSN 0011-4901), vol. 42, June 1984, p. 42-45. In German.

The deep diving system Titan is intended for biophysical research projects. The installation consists of three high-pressure chambers. One of the chambers provides a residential area, while another chamber is filled with water. A 'transfer chamber' is also available. The installation is licensed for manned operations involving pressures of as much as 100 bar, corresponding to a depth of 1000 m. Unmanned operations are permitted for pressure conditions corresponding to 1500 m. Medical examinations regarding divers in a gaseous atmosphere and in fresh or salt water can be conducted. A central control desk is used for the operation of the diving simulator. Three independent telephone lines provide means of communication. Special electronic equipment is used to correct speech distortion related to a helium environment. Several television cameras are provided to keep the chambers under continuous surveillance. Attention is given design details, the life-support system, the data acquisition system, the supply systems, future research tasks, and medical problems in diving operations involving the depth range from 300 to 600 m.

G.R.

#### N84-28835# Joint Publications Research Service, Arlington, Va. FOOD SPECIALISTS DISCUSS COSMONAUT DIET

A. MALTSEV and M. FRUMKIN *In its* USSR Rept.: Space (JPRS-USP-84-003) p 43-45 14 Jun. 1984 Transl. into ENGLISH from Pravda (USSR), 22 Sep. 1983 p 3  
 Avail: NTIS HC A07

As the scope of space research expands the efforts in the field of food technology are growing and developing. The nutritional value of food products is studied in greater detail. Rations are created with a preventative purpose and a controlled selection of products depending on the various durations of the crew in space, as well as the volume and nature of the work to be accomplished. Author

#### N84-29464\*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.

##### PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Report, Mar. - Aug. 1983

W. B. ROUSE, J. M. HAMMER, N. M. MORRIS, E. N. BROWN, and W. C. YOON Aug. 1983 73 p refs  
 (Contract NAG2-123)  
 (NASA-CR-173782; NAS 1.26:173782) Avail: NTIS HC A04/MF A01 CSCL 05H

The use of advanced software engineering methods (e.g., from artificial intelligence) to aid aircraft crews in procedure selection and execution is investigated. Human problem solving in dynamic environments as effected by the human's level of knowledge of system operations is examined. Progress on the development of full scale simulation facilities is also discussed. M.A.C.

N84-29465\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

##### PHYSIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL EFFECTS OF NOISE

K. D. KRYTER (Acousis Co., Bodega Bay, Calif.) Jul. 1984 654 p refs  
 (Contract NAS1-15435)  
 (NASA-RP-1115; L-15612; NAS 1.61:1115) Avail: NTIS HC A99/MF A01 CSCL 20A

The physiological, and behavioral effects of noise on man are investigated. Basic parameters such as definitions of noise, measuring techniques of noise, and the physiology of the ear are presented prior to the development of topics on hearing loss, speech communication in noise, social effects of noise, and the health effects of noise pollution. Recommendations for the assessment and subsequent control of noise is included.

N84-29470\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

##### LOUDNESS, NOISINESS, AND VIBRATION EFFECTS

*In its* Physiol., Psychol., and Social Effects of Noise p 111-174 Jul. 1984 refs  
 Avail: NTIS HC A99/MF A01 CSCL 05H

The physical measurement of noise that determines psychological and physical behavioral effects in real life is investigated. The roles of loudness and noisiness judgement in the development of these measurement procedures are also examined. M.A.C.

N84-29471\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

##### PRESBYCUSIS, SOCIOCUSIS, AND NOSOCUSIS

*In its* Physiol., Psychol., and Social Effects of Noise p 175-218 Jul. 1984 refs  
 Avail: NTIS HC A99/MF A01 CSCL 05H

The establishment of a baseline of normal hearing is investigated through the examination of pure tone hearing level surveys and variables such as age, sociocusis, sex, race, and otological disorders. Mathematical formulae used to predict hearing levels in industrial and nonindustrial surveys is included. M.A.C.

N84-29474\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

##### MENTAL AND PSYCHOMOTOR TASK PERFORMANCE IN NOISE

*In its* Physiol., Psychol., and Social Effects of Noise p 343-388 Jul. 1984 refs  
 Avail: NTIS HC A99/MF A01 CSCL 05H

The possible adverse effects of noise on mental and psychomotor task performance were a matter of practical concern for centuries and continue to be a matter of scientific controversy. A review indicates that except for the masking or interferences with the hearing of sounds needed to perform a given task, noise does not necessarily interfere with work performance. However, because of difficulties in the experimental control of some of these possible effects, the results of research on work performance in noise were inconsistent and difficult to encompass in any simple theoretical construct. Indeed, reviews of research in this area conclude that simple generalizations about possible effects of noise on work performance cannot be made. Nevertheless, several general theories were put forth. B.G.

N84-29475\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

##### NONAUDITORY-SYSTEM RESPONSE TO NOISE AND EFFECTS ON HEALTH

*In its* Physiol., Psychol., and Social Effects of Noise p 389-524 Jul. 1984 refs  
 Avail: NTIS HC A99/MF A01 CSCL 05H

Continued exposure to noise in real life can be a source of physiological stress possibly capable of causing health disorders beyond that of direct damage to the auditory receptor system. Some theorists hold that some of these effects occur because of



innate, reflexive responses to noise that cannot be prevented or, when suppressed, that require some effort that may itself become somewhat debilitating in time. An alternative theory is that the truly nonhabituating reflexive responses to noise are not sufficient in character to cause any ill health, and that those responses to noise that are or could be significant in this regard are not directly the result of exposure to noise but are responses to the emotional meanings conveyed by the sounds. Obviously, the degree to which noise can lead to harm to nonauditory physiological systems of the body are questions of utmost importance for the assessment of the need for noise control. Author

**N84-29476\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

#### REACTIONS TO COMMUNITY NOISE

*In its* Physiol., Psychol., and Social Effects of Noise p 525-606 Jul. 1984 refs

Avail: NTIS HC A99/MF A01 CSCL 05H

Most of the research on reactions of people to community noise is divided into studies of annoyance as measured by attitude surveys and annoyance as measured by complaint behavior, including legal actions. This research has provided means of testing the concept promulgated over 20 years ago that the average amount of noise energy from significant sources that intrudes daily into houses and living areas can be used to predict the impact of the noise on people in a community. However, research data on annoyance and complaint behavior collected over the past 10 to 20 years have shown that there are significant limitations and variables that must be considered in the fair application of the noise energy concept in its simplest form. Author

**N84-29478\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

#### UNDERSTANDING A TECHNICAL LANGUAGE: A SCHEMA-BASED APPROACH

P. FALZON (Institute National de Recherche d'Information et d'Automatique, Rocquencourt, France) Jul. 1984 28 p refs (NASA-TM-85868; A-5694; NAS 1.15:85868) Avail: NTIS HC A03/MF A01 CSCL 05H

Workers in many job categories tend to develop technical languages, which are restricted subjects of natural language. A better knowledge of these restrictions provides guidelines for the design of the restricted languages of interactive systems. Accordingly, a technical language used by air-traffic controllers in their communications with pilots was studied. A method of analysis is presented that allows the schemata underlying each category of messages to be identified. This schematic knowledge was implemented in programs, which assume that the goal-oriented aspect of technical languages (and particularly the restricted domain of discourse) limits the processes and the data necessary in order to understand the messages (monosemy, limited vocabulary, evocation of the schemata by some command words, absence of syntax). The programs can interpret, and translate into sequences of action, the messages emitted by the controllers. Author

**N84-29479\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

#### HUMAN EXPOSURE IN LOW EARTH ORBIT

J. W. WILSON and F. CUCINOTTA (Old Dominion Univ.) Aug. 1984 22 p refs

(NASA-TP-2344; L-15803; NAS 1.60:2344) Avail: NTIS HC A02/MF A01 CSCL 06R

Human exposure to trapped electrons and protons in low Earth orbit (LEO) is evaluated on a basis of a simple approximation of the human geometry for spherical shell shields of varying thickness. A data base is presented that may be used to make preliminary assessment of the impact of radiation exposure constraints on human performance. Detailed shielding studies should be performed before final design considerations. A sample impact assessment is discussed on the basis of presently accepted allowable exposure limits. A brief discussion is given on the

anticipated impact of an ongoing reassessment of allowable exposure limits. Author

**N84-29480#** Illinois Univ., Urbana. Engineering-Psychology Research Lab.

#### A MULTIPLE PROCESSING RESOURCE EXPLANATION OF THE SUBJECTIVE DIMENSIONS OF OPERATOR WORKLOAD

W. L. DERRICK and C. D. WICKENS Feb. 1984 93 p

(Contract N00014-79-C-0658)

(AD-A141455; EPL-84-2/ONR-84-1) Avail: NTIS HC A05/MF A01 CSCL 05H

Multiple measures of operator workload may dissociate, or fail to agree, for a given task. The goal of this study was to determine which task difficulty (workload) as indexed by attentional resource demand could explain the attendant variance in a second index of workload, subjective ratings. A multiple resource model of processing resources (Wickens, 1980) guided construction of tasks of differential resource demand. These tasks were both performed by subjects and rated according to workload similarity. Scaling and clustering analyses of the similarity data produced subjective dimensions/clusters of workload that were explained in terms of resource demand, task structure, and task characteristics. Data collected to support this analysis - task performance, physiological measures of heart period variability, effort ratings - revealed three primary dissociations. These dissociations were explained by using the parameters of Wickens' multiple resource theory. GRA

**N84-29481#** Naval Training Equipment Center, Orlando, Fla. **ANNOTATED BIBLIOGRAPHY OF HUMAN FACTORS LABORATORY REPORTS (1945-1968): SUPPLEMENT 4, 1979-1983**

Jan. 1984 36 p

(AD-A142141; NAVTRAEQUIPC-IH-158) Avail: NTIS HC A03/MF A01 CSCL 05E

A complete bibliographic reference and an abstract are given for each publication of the Human Factors Laboratory from 1979 through 1983 including in-house and contractor-developed documents. Three indexes are provided: Index by Source, Author Index, and Subject Matter Index. GRA

**N84-29482#** Defence Research Establishment, Ottawa. (Ontario).

#### GUIDELINES FOR MAN/DISPLAY INTERFACES WITH RELEVANCE TO MILITARY ENVIRONMENTS

B. FORD Mar. 1984 42 p

(AD-A142171; DREO-TN-84-3) Avail: NTIS HC A03/MF A01 CSCL 05H

The report presents guidelines for developing a man/display interface. Military environment requirements are addressed. The guidelines include: methods of highlighting the displays; techniques for minimizing operator confusion and error; methods for system prompt, and user reply; choice of hardware control devices; and consideration of display and system peripheral ergonomics. GRA

**N84-29483#** Department of the Army, Washington, D. C. **AN EXPLOSIVE ORDNANCE DISPOSAL PROTECTIVE SUIT Patent Application**

R. MARTONE, inventor (to Army) 5 Jun. 1984 14 p

(AD-D011072; US-PATENT-APPL-SN-596778) Avail: NTIS HC A02/MF A01 CSCL 06Q

An explosive ordnance disposal protective suit which includes trousers, a coat with collar, a protective helmet and a combination face shield-chest plate. The face shield-chest plate is supported and held in place by a pocket on the front of the coat. The chest plate is made of laminated layers of woven glass roving fabric. The face shield is a laminate of an optically clear polycarbonate sheet adhesively bonded to an optically clear acrylic sheet. GRA

**N84-29484#** Department of the Air Force, Washington, D.C.  
**ACCOMMODATIVE AMPLITUDE AND SPEED MEASURING INSTRUMENT Patent Application**

L. V. GENCO and H. L. TASK, inventors (to Air Force) 22 Feb. 1984 14 p  
 (AD-D011032; US-PATENT-APPL-SN-582496) Avail: NTIS HC A02/MF A01 CSCL 06L

In accordance with the foregoing principles and objects of the present invention, a novel instrument and method for measuring the accommodative amplitude and speed of the eye of a subject is described. The instrument for making the measurements according to the present invention comprises a pair of illuminated or luminous visual displays disposed for viewing along an optical axis, the images of the displays superimposed upon each other for viewing by a subject, one of the displays comprising a pattern having a plurality of distinct and recognizable orientations with respect to the axis along which it is viewed, an orientation generator for randomly and alternately generating one of the orientations for viewing by the subject, a switch operable by the subject for turning the displays off and indicating the observed orientation of the random pattern, and the time the displays were on or the time between presentation of one display and the correct identification of the other.

GRA

**N84-29485#** California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.

**CALCULATION OF NATURAL VENTILATION AND COMFORT**  
 M. SHERMAN and S. ASHLEY Jan. 1984 33 p refs Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Engr. Meeting, Atlanta, 29 Jan. - 1 Feb. 1984  
 (Contract DE-AC03-76SF-00098)  
 (DE84-009215; LBL-16036; CONF-840124-6) Avail: NTIS HC A03/MF A01

Natural ventilation can be used to greatly reduce cooling loads and increase human comfort in buildings in hot, humid climates. Airflow rates directly affect a building's heat balance by removing internal gains and directly affect comfort levels by increasing the body's convective and evaporative heat transfer coefficients; these airflow rates are determined by the wind pressure on the faces of the building (which is calculated from the wind speed and pressure coefficient) and the amount of open area. Wind pressure coefficients can be obtained in three ways: (1) direct field measurement, (2) by scale model experiments in a wind tunnel, and (3) by comparison with standard wind tunnel data. Measurements made on two buildings at the Kaneohe Marine Corps Air Station (KMCA) on the island of Oahu, Hawaii, during the summer of 1982 are described. These full scale measurements of pressure coefficients will be compared to reduced scale measurements made at the boundary layer wind tunnel at the Naval Civil Engineering Laboratory (NCEL). Estimates of the indoor comfort levels for different window conditions will be used as a basis for determining the acceptability of natural ventilation for cooling.

DOE

**N84-29486#** Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.

**IMPROVED G-TOLERANCE WITH ASSISTED POSITIVE PRESSURE BREATHING AND ANTI-GRAVITY SUIT WITH READY PRESSURE AND FASTER FILLING**

U. I. BALLDIN Feb. 1984 40 p refs In SWEDISH; ENGLISH summary  
 (FOA-A-58002-H1; ISSN-0281-0239) Avail: NTIS HC A03/MF A01

Methods to enhance G-tolerance are discussed, including improved physiological selection of pilots, G-Training in human centrifuge, muscle strength training, and technological solutions. A ready pressure anti-G suit, adjustable in magnitude and time is described. Filling time of the anti-G suit (to 90%) is reduced from 5 to 1 sec, preferably initiated by flight control impulses through the main computer of the aircraft at G-loads exceeding 2 F; positive pressure breathing and assisted positive pressure breathing, are activated at G-loads exceeding 3 to 4 G proportionally to the

G-load of G onset rate and with a maximum of 6 to 8 kPa assisted breathing pressure.

Author (ESA)

**N84-30676#** Joint Publications Research Service, Arlington, Va.  
**ENGINEERING PHYSIOLOGY: NEW AREA FOR USE OF CONTROL THEORY Abstract Only**

V. N. NOVOSELTSEV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-016) p 51 30 Jul. 1984 Transl. into ENGLISH from Izmereniya Kontrol Avtomatiz. (Moscow), no. 4, 1983 p 55-63  
 Avail: NTIS HC A06

The task of engineering physiology is to study and organize the interaction of technical control systems with the physiological systems of the body to maintain its viability and working capacity. In developing the methodological bases of engineering physiology systems, the requirements of the body and nature of homeostasis are formalized and described. The resulting expressions are then used to construct models of engineering physiology systems. For example, individual protective devices including passive isolation, active isolation, and artificial flows of matter and energy modify the demand equations of the model. A similar situation exists in medical engineering physiology, particularly with regard to auxiliary organs. The development of control algorithms, such as the one needed for an artificial pancreases, is also based on models. Engineering physiology successfully copes with the transport functions of the body, but is not yet adequate for biochemical and metabolic processes. The control of medical devices for delivery of nutrients and oxygen and the removal of waste is well developed, while control of heat producing, energetic, and synthetic processes requires further research.

Author

**N84-30702#** Committee on Commerce, Science, and Transportation (U. S. Senate).

**CABIN AIR QUALITY**

Washington GPO 1984 81 p refs Hearing on S. 197 before the Subcomm. on Aviation of the Comm. on Com., Sci., and Transportation, 98th Congr., 1st Sess., 9 Nov. 1983 (GPO-29-522) Avail: Subcommittee on Aviation

Testimony was heard before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Aviation, concerning hazards found on commercial aircraft. Specifically, disease transmission, onboard fires and high ozone levels aboard commercial aircraft were discussed. The issue is whether the airlines are doing enough to insure proper passenger safety in hazardous situations in the closed environments of commercial aircraft cabins. A bill is proposed which would direct the Secretary of Transportation to conduct an independent study to determine the adequacy of certain industry practices and Federal Aviation Administration rules and regulations, and for other purposes.

S.B.

**N84-30703#** Technische Hogeschool, Delft (Netherlands). Lab. for Measurement and Control.

**MAN-MACHINE SYSTEMS GROUP Progress Report, Jul. 1976 - Dec. 1982**

T. VANLUNTEREN, ed. Sep. 1983 287 p refs  
 (WTHD-161; PR-4) Avail: NTIS HC A13/MF A01

Supervisory control of industrial processes, fault management, modeling the shoulder girdle for rehabilitation, information processing for use in the treatment of the severely physically handicapped, treatment of patients with brachial plexus lesions, arm prostheses for unilateral amputees, and communication aids for the handicapped are discussed.

**N84-30704#** Technische Hogeschool, Delft (Netherlands).

**THE MAN-MACHINE SYSTEMS GROUP**

H. G. STASSEN *In its* Man-Machine Systems Group p 8-29 Sep. 1983

Avail: NTIS HC A13/MF A01

Research and teaching activities related to man machine systems are summarized. Research projects include manual and supervisory control in industrial systems, and rehabilitation of physically handicapped patients. Control and decision making

models were developed. Protheses were tested, and an eyeball position controlled communication system (EPCOS) and lightspot operated typewriter (LOT) were developed. Author (ESA)

**N84-30705#** Technische Hogeschool, Delft (Netherlands).

**SUMMARIES OF DOCTORATE THESES**

W. VELDHUYZEN, T. VANLUNTEREN, J. KOK, R. VANWIJK, T. SOEDE, and T. ELAND *In its* Man-Machine Systems Group p 22-29 Sep. 1983

Avail: NTIS HC A13/MF A01

Research concerning the manual control of ships, the identification of human operator describing function models with one or two inputs in closed loop systems, the evaluation of models describing human operator control of slowly responding complex systems, the mental load in arm prosthesis control, and identification of the adaptive feedback of the human motor system using the response difference method is summarized.

Author (ESA)

**N84-30706#** Technische Hogeschool, Delft (Netherlands).

**SUPERVISORY CONTROL: INTRODUCTION AND THEORY**

J. KOK and J. VANDIETEN *In its* Man-Machine Systems Group p 30-47 Sep. 1983 refs

Avail: NTIS HC A13/MF A01

A method to describe human operator control of slowly responding complex systems, the observer/controller/decision model, is introduced. Algorithms used to reduce computational complexity and cost in parameter identification are outlined. The experimental design for model testing with a simplified utility plant simulation is described.

Author (ESA)

**N84-30707#** Technische Hogeschool, Delft (Netherlands).

**MODELING THE HUMAN OPERATOR'S SUPERVISING BEHAVIOR**

T. WHITE *In its* Man-Machine Systems Group p 48-65 Sep. 1983 refs Sponsored by Netherlands Organization for the Advancement of Pure Research (ZWO)

Avail: NTIS HC A13/MF A01

A human supervisor model in which the supervisor acts as a suboptimal controller, taking into account the inherent limitation that his observation of the output process variables can be inaccurate, is discussed. This limitation is modeled by a noise called the observation noise. It is assumed that the human supervisor possesses exact knowledge of the generated control signals. Hence, the model consists of three subsystems: an observer, a controller and a decision making element, with the last one acting on each of the two other subsystems. Relations between task variables (system disturbances, display structure, task requirements, system dynamics) and model parameters were investigated.

Author (ESA)

**N84-30708#** Technische Hogeschool, Delft (Netherlands).

**A UTILITY PLANT SIMULATOR FOR CONTROL ROOM EXPERIMENTS**

R. VANDERVELDT and H. SCHNEIDER *In its* Man-Machine Systems Group p 66-79 Sep. 1983 refs Sponsored by Foxboro Co.

Avail: NTIS HC A13/MF A01

The extent to which the human supervisor's internal representation is a replica of the actual process and the role of different types of overview displays (historic, status and predictive displays) on the way the human supervisor updates his internal representation are discussed. In order to measure the accuracy of the operator's internal representation and to gain insight into the type of information the operator needs, a simulated utility plant was created. Experiments with and without a predictive display indicate that the simulation is realistic. No differences between the two conditions are reported.

Author (ESA)

**N84-30709#** Technische Hogeschool, Delft (Netherlands).

**FAULT MANAGEMENT**

W. THIJS *In its* Man-Machine Systems Group p 80-99 Sep. 1983 refs Sponsored by Organization for Applied Scientific Research TNO and Institute for Mechanical Constructions

Avail: NTIS HC A13/MF A01

Cognitive, behavioristic and normative approaches to fault management in industrial processes are outlined. The cognitive approach is descriptive, speculative and very general. The behavioristic approach is descriptive and task specific. The normative approach is prescriptive, and is based on Savage's normative decision theory. This theory concerns the selection of acts out of a set of possible acts in such a way that the expected utility of the consequences is maximized. Possible states of the world, how alternative actions relate consequences to these possible states, and how the gravity of the different consequences may be compared are considered. The uncertainty of these items is expressed in a subjective or personal probability.

Author (ESA)

**N84-30710#** Technische Hogeschool, Delft (Netherlands).

**A MODEL OF THE SHOULDER GIRDLE FOR USE IN REHABILITATION**

G. PRONK *In its* Man-Machine Systems Group p 100-124 Sep. 1983 refs

Avail: NTIS HC A13/MF A01

A method to predict the effects of shoulder arthrodesis, and to calculate an optimal fixation position of the humerus with regard to the scapula is discussed. The development of a biophysical-mathematical model describing the kinematics of the shoulder girdle so that the possible range of the hand can be predicted is described. The development of a clinical method to measure externally the mobility of the scapula before a possible omodesis, so that the optimal fixation position can be predicted is summarized. The generation of a set of requirements concerning the possibilities of positioning the hand, based on an analysis of daily life-activities, is outlined.

Author (ESA)

**N84-30711#** Technische Hogeschool, Delft (Netherlands).

**INFORMATION PROCESSING FOR USE IN THE TREATMENT OF SEVERELY PHYSICALLY HANDICAPPED PERSONS**

R. HOOGENDOORN, H. BAKKER, G. J. VANDERKOLK, P. BALK, G. MORSINK, H. STASSEN, and T. VANLUNTEREN *In its* Man-Machine Systems Group p 125-151 Sep. 1983 refs

Sponsored by Ministry of Health and Environment Protection, Rehabilitation Center De Hoogstraat and Ministry of Social Affairs

Avail: NTIS HC A13/MF A01

A cybernetic model of the treatment of patients with injuries of the spinal cord was developed. The applicability of an information processing system in a rehabilitation center was studied. Man-computer communication concerning the data involved in the treatment of patients was investigated. The model shows that moment of discharge of patients depends on readiness of home adaptations and availability of specialized equipment. It is possible to construct models which would speed up prognoses, enabling patients to be discharged 10 weeks sooner. A goal-directed information management method based on systems theory proves superior to one designed for materials handling.

Author (ESA)

**N84-30712#** Technische Hogeschool, Delft (Netherlands).

**TREATMENT OF PATIENTS WITH A LESION OF THE BRACHIAL PLEXUS**

B. VANHUYGEVOORT, C. DELOUW, and R. JASPERS *In its* Man-Machine Systems Group p 152-168 Sep. 1983 refs

Sponsored by European Social Fund and Ministry of Social Affairs

Avail: NTIS HC A13/MF A01

Information processing in a multidisciplinary rehabilitation team for patients with brachial plexus lesions was studied in order to help medical personnel and patients decide if a shoulder arthrodesis should be executed, and if nonomodesis patients will get an elbow orthosis. Results show that it is not possible to apply a simple criterion to the present data in order to clearly separate the groups

with and without an indication for an omodesis. For restoring arm function by executing an omodesis, a badly functioning forearm may be a negative indication. Author (ESA)

**N84-30713#** Technische Hogeschool, Delft (Netherlands).  
**EVALUATION OF ARM PROTHESES FOR UNILATERAL AMPUTEES**

J. VANDIETEN, T. SOEDE (Netherlands Institute for Preventive Health Care), E. VANLUNTEREN-GERRITSEN, M. ZUITHOFF, H. STASSEN, and T. VANLUNTEREN *In its* Man-Machine Systems Group p 169-196 Sep. 1983 refs Sponsored by Fund for Preventive Health Care  
Avail: NTIS HC A13/MF A01

An arm prosthesis was compared with existing models in laboratory and field tasks. Using nonamputees fitted with a device to simulate amputation, technical aspects (such as gripping force and opening width) and task accomplishment, and mental load involved in performing the tasks were investigated. The effect of the prosthesis on real amputees' lives, and the use, benefits, and burdens of the device were examined in a field study.

Author (ESA)

**N84-30714#** Technische Hogeschool, Delft (Netherlands).  
**PROPRIOCEPTION**

T. VANLUNTEREN, T. ELAND, D. SPARREBOOM, and K. RUITENBEEK *In its* Man-Machine Systems Group p 197-243 Sep. 1983 refs Sponsored by Netherlands Organization for the Advancement of Pure Research (ZWO)  
Avail: NTIS HC A13/MF A01

Two models for step tracking behavior are considered: a describing function model, which is an extension of a continuous pursuit tracking model, and a model based on psychophysiological considerations, which uses an internal model concept. Parameter identification methods applied for these models are discussed. Experiments executed using a manipulator with variable dynamics are summarized.

Author (ESA)

**N84-30715#** Technische Hogeschool, Delft (Netherlands).  
**COMMUNICATION AIDS FOR THE HANDICAPPED**

H. STASSEN, E. FRIETMAN, and A. VANDIJK *In its* Man-Machine Systems Group p 244-262 Sep. 1983 refs  
Avail: NTIS HC A13/MF A01

A lightspot operated typewriter (LOT), an eyeball position controlled communication system (EPCOS), and a training aid for use in rehabilitation of aphasia patients were developed. The LOT uses a small lamp fixed to an eye glasses frame to activate light sensitive elements on a control panel, linked to typewriter keys. One subject achieved a typing speed of 100 characters per min after 20 hrs training, the others at least 45 characters per min. The EPCOS is similar to the LOT, but requires microprocessor based control given the difficulty of sensing and transforming eye movements. Typing speed is similar to LOT. The aphasia trainer uses a microcomputer to run word games programs which the patient can use at home.

Author (ESA)

**N84-30716#** Virginia Polytechnic Inst. and State Univ., Blacksburg. Lab. of Human Factors.

**OPERATOR PERFORMANCE ON FLAT-PANEL DISPLAYS WITH LINE AND CELL FAILURES**

S. R. ABRANSON and H. L. SNYDER Jan. 1984 53 p  
(Contract N00014-78-C-0238)  
(AD-A142340; VPI-HFL-83-3) Avail: NTIS HC A04/MF A01 CSDL 05H

This technical report describes the results of an experiment to determine the influence of individual line and cell failures on readability of flat-panel displays. A 1024 x 1024 pixel plasma display was used to present reading passages. Selected percentages of dots or cells were failed (either on or off) randomly within the passage. Reading time for these passages was measured and related to the type of failure, percent failure, character font, and case of the characters (upper and mixed). The results clearly indicate that all these variables have an effect upon readability of the display, but that interactions among the variables are complex

and important. Design criteria for displays which are subject to such failures are offered, as are quality assurance criteria.

Author (GRA)

**N84-30717#** Massachusetts Inst. of Tech., Cambridge. Lab. for Man-Machine Systems.

**INTERACTION OF HUMAN COGNITIVE MODELS AND COMPUTER-BASED MODELS IN SUPERVISORY CONTROL**

T. B. SHERIDAN Mar. 1984 55 p  
(Contract N00014-83-K-0193)  
(AD-A142677) Avail: NTIS HC A04/MF A01 CSDL 05H

This report summarizes the first year's effort of a three-year research project on how knowledge is represented in decision aids and control systems and how the operators of such systems apparently represent and utilize such knowledge. The first section of the report discusses the relationship of computer-based supervisory control to computer-based decision-aiding (expert systems) by identifying component variables and functions and building up block diagrams. The second section deals quantitatively with internal models, knowledge, and calibration, both with respect to expectations of the existence of identifiable states of the world and with respect to the overlap of meanings of terms (mental or linguistic encodings, fuzzy variables). The third section discusses mental models and their importance in three kinds of activities supervisors must do in complex systems: (1) discovering how things work; (2) determining what is wanted out of the set of alternatives states of the attributes; (3) encoding and manipulating fuzzy concepts; (4) combining evidence and confidence; and (5) deciding what to do. The fourth section of the report deals with the human use of computer-based models in automatic control and in decision-aiding.

GRA

**N84-30718#** Kema (N. V.), Arnhem (Netherlands). Risk and Reliability Analysis Group.

**HUMAN RELIABILITY ANALYSIS USING EVENT TREES**

G. HESLINGA 1983 29 p refs Sponsored in cooperation with Delft Technical Univ. and Dodewaard Nuclear Plant, Netherlands  
(S/T-REPT-VOL-1-NO-3; B8464516; ISBN-90-353-0007-6; ISSN-0167-8590) Avail: NTIS HC A03/MF A01

Operator behavior in a technologically complex situation such as a nuclear power plant shutdown is analyzed by making a human reliability analysis event tree (HRA event tree) of each action, breaking down each action into small elementary steps. The application of event trees in human reliability analysis implies more difficulties than in the case of technical systems since the operator is able to recover a wrong performance; memory influences play a significant role. The study shows that although in practice the operator recovers fault partly, theoretically this can be described as starting the whole event tree again. Formulas by which the probability of reaching a specific failure consequence on passing through the HRA event tree after several times of recovery are derived.

Author (ESA)

**N84-30719#** Weston (Roy F.), Inc., West Chester, Pa.  
**OPERATION AND MAINTENANCE OF SELECTED OZONE AND ULTRAVIOLET DISINFECTION SYSTEMS Final Report, Jun. 1982 - Sep. 1983**

R. JUNKINS May 1984 254 p refs  
(Contract EPA-68-03-3019)  
(PB84-180124; EPA-600/2-84-087) Avail: NTIS HC A12/MF A01 CSDL 13B

As part of the Environmental Protection Agency's efforts to compile and promulgate design and operational information concerning the use of ozone disinfection of UV light disinfection in place of chlorine disinfection for wastewater effluents, a series of on-site evaluations were conducted at seven municipal wastewater treatment plants that have or are using ozone for the disinfection, five water treatment plants using ozone for disinfection and/or odor control, and three municipal wastewater treatment plants that have used or are using UV disinfection. During these plant visits operating data were reviewed, operational practices observed, and operating personnel were interviewed in order to

establish operation and maintenance (O&M) causative factors relating to poor and efficient process performance. The typical O&M problems are listed and the recommended remedial actions necessary to correct those problems are presented. GRA

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## PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

**A84-40429\*** Leiden Univ. (Netherlands).

**CHEMICAL EVOLUTION IN SPACE**

J. M. GREENBERG (Leiden, Rijksuniversiteit, Leiden, Netherlands) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 25-36. Research supported by the Stichting voor Fundamenteel Onderzoek der Materie. refs  
(Contract NGR-33-018-149)

Most of the complex molecules in interstellar space are probably contained in small, frozen interstellar dust grains which are about as old as the earth and have been photochemically converted into large organic molecules. These molecules' maximum molecular weight is limited only by the approximately 0.1-micron grain size. Their evolution leads from cool, evolved stellar atmospheres' formation of seedlings to destruction through incorporation into the material of new stars. Organic dust constitutes about 0.1 percent of the total mass of the Milky Way, far outweighing any estimates of total planetary mass in the Galaxy. Because comets may be virtually pure, aggregated interstellar dust, they offer a source of interstellar organic material for detailed study. O.C.

**A84-40430**

**SIMULATION OF INTERSTELLAR CHEMICAL EVOLUTION IN A LOW TEMPERATURE PLASMA**

Y. ISHIKAWA and K. KURIKI (Tokyo, University, Tokyo, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 37-42. refs

In order to simulate interstellar chemical evolution, the chemical process was studied in a laboratory plasma flow. The apparatus was so designed as to establish the similarity between laboratory and cosmic conditions. The plasma temperature was found to be less than 100 K in the downstream region. HCN, HC3N, H2CO, and several kinds of hydrocarbons were produced from the plasma, whose elementary composition was approximately same as the cosmic abundance. Based on the analysis by laser-induced fluorescence method, HCN and HC3N were concluded to be synthesized via CN-loss reactions, while it was unlikely that the syntheses of C2H2 and H2CO were related to the generation or depletion of C2. Author

**A84-40432\*** Toledo Univ., Ohio.

**THE COMETARY CONNECTION WITH PREBIOTIC CHEMISTRY**

A. H. ELSEMME (Toledo, University, Toledo, OH) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 51-60. refs  
(Contract NSF AST-82-07435; NSG-7301)

The latent heat of water ice has been established to control the sublimation of most cometary nuclei. The next most abundant molecules are CO and/or CO2, typically reaching 10-30 percent of the water content. The other species are in the range of 1-10 percent or less and include the newly discovered NH3. HCN and CH3CN are two other important prebiotic molecules present at a comparable (1 percent) level. Attention is drawn to similarities

between these compositions and those inferred for the primordial earth. O.C.

**A84-40434\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**THE EVOLUTION OF THE PREBIOTIC ATMOSPHERE**

J. F. KASTING (NASA, Ames Research Center, Moffett Field, CA) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 75-82. refs

One-dimensional radiative-convective and photochemical models are used to estimate the vertical temperature structure and composition of the earth's prebiotic atmosphere. Greatly enhanced CO2 levels (100-1000 times present) are required to keep the mean surface temperature above freezing in the face of decreased solar luminosity during the earth's early history. Such high CO2 partial pressures would have affected the atmospheric oxidation state by facilitating the photochemical production of soluble species including H2O2 and H2CO. Oxidation of ferrous iron in the oceans by H2O2 dissolved in rainwater should have kept the atmospheric H2 mixing ratio above 0.0002, and the ground-level O2 mixing ratio below 10 to the -11th, regardless of the magnitude of the rate of volcanic release of reduced gases.

Author

**A84-40475**

**CIRCULARLY POLARIZED SOLAR RADIO BURSTS ASSOCIATED WITH SUNSPOT ACTIVITIES AND THEIR POSSIBLE SIGNIFICANCE IN THE FORMATION OF CHIRALLY ASYMMETRIC BIOTIC SUBSTANCES FROM A CHIRALLY SYMMETRIC PREBIOTIC MEDIUM**

N. HOKKYO (Hitachi, Ltd., Hitachi Energy Research Laboratory, Hitachi, Japan) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 447-450. refs

The present observational status of the anomalous solar electromagnetic radiation associated with sunspot activities is briefly surveyed with an emphasis on the circularly polarized microwave bursts which might have significance in the formation of optically active biotic substances from an optically inactive prebiotic medium already present in the primordial reducing atmosphere of the earth or on interstellar dust falling on the earth. Author

**A84-40512\*** Florida State Univ., Tallahassee.

**THE ANTARCTIC CRYPTOENDOLITHIC ECOSYSTEM - RELEVANCE TO EXOBIOLOGY**

E. I. FRIEDMANN and R. OCAMPO-FRIEDMANN (Florida State University, Tallahassee, FL) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) Origins of Life (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 771-776. refs  
(Contract NSG-7337; NSF DPP-80-17581)

Cryptoendolithic microorganisms in the Antarctic desert live inside porous sandstone rocks, protected by a thin rock crust. While the rock surface is abiotic, the microclimate inside the rock is comparatively mild. These organisms may have descended from early, pre-glaciation Antarctic life forms and thus may represent the last outpost of life in a gradually deteriorating environment. Assuming that life once arose on Mars, it is conceivable that, following the loss of water, the last of surviving organisms withdrew to similar insulated microenvironments. Because such microscopic pockets have little connection with the outside environment, their detection may be difficult. The chances that the Viking lander could sample cryptoendolithic microorganisms in the Antarctic desert would be infinitesimal. Author

**A84-40516****PROJECT CASSINI - A SATURN ORBITER/TITAN PROBE MISSION PROPOSAL**

D. GAUTIER (Paris, Observatoire, Meudon, Hauts-de-Seine, France) and W. H. IP (Max-Planck-Institut fuer Aeronomie, Katlenburg, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 802-807. refs

Titan is the only moon in the solar system with a substantial atmosphere. The organic chemistry of its N<sub>2</sub>-CH<sub>4</sub> atmosphere may resemble that of the earth's primitive atmosphere before life arose. The investigation of the synthesis of prebiotic molecules in Titan's atmosphere, and the atmospheric and surface environments of this planet-sized moon, will be the focal point of the Cassini Project proposed to the European Space Agency for an international Saturn Orbiter/Titan Probe mission. Author

**A84-40518****EXOBIOLGY AND THE SOLAR SYSTEM - THE CASSINI MISSION TO TITAN**

F. RAULIN (Paris XII, Universite, Creteil, Val-de-Marne, France), D. GAUTIER (Paris, Observatoire, Meudon, Hauts-de-Seine, France), and W. H. IP (Max-Planck-Institut fuer Aeronomie, Katlenburg, West Germany) (Deutsche Forschungsgemeinschaft and Universitaet Mainz, International Conference on the Origin of Life, 7th, Mainz, West Germany, July 10-15, 1983) *Origins of Life* (ISSN 0302-1688), vol. 14, no. 1-4, 1984, p. 817-824.

The main scientific objectives of Cassini, a space mission to Titan, would include the search for organic molecules and the mapping of the vertical distribution of chemical species such as CH<sub>4</sub>, HCN, and CO. Investigations of the chemical nature of the organic aerosols, the internal structure and physical nature of the surface, the evolution of the atmosphere, and solar wind and magnetosphere interactions would also be included. The spacecraft would include a Saturn orbiter which would investigate the planet's clouds and the surface of satellites including their emission temperatures. Saturn's ionosphere and magnetosphere would also be investigated through radiowave and plasma experiments. The spacecraft's Titan probe would consist of a preentry science package, a deceleration module, and a descent module. J.P.

**A84-42312****SPONTANEOUS GENERATION AND AMPLIFICATION OF OPTICAL ACTIVITY IN ALPHA-AMINO ACIDS BY ENANTIOSELECTIVE OCCLUSION INTO CENTROSYMMETRIC CRYSTALS OF GLYCINE**

I. WEISSBUCH, L. ADDADI, Z. BERKOVITCH-YELLIN, E. GATI, M. LAHAV, and L. LEISEROWITZ (Weizmann Institute of Science, Rehovot, Israel) *Nature* (ISSN 0028-0836), vol. 310, July 12, 1984, p. 161-164. Research supported by the Petroleum Research Fund, and U.S.-Israel Binational Science Foundation. refs

It has recently been observed that particular enantiomers can be selectively incorporated into not only chiral crystals, but also into the opposite enantiotopic faces of centrosymmetric crystals. If one such face of a centrosymmetric crystal is blocked, enantioselective occlusion of the opposite face will remove one enantiomer preferentially from the racemic mixture. It is presently reported that this process can occur with centrosymmetric glycine crystals in a manner that may prove relevant to the generation of optical activity during prebiotic evolution. O.C.

**A84-42499\*** Cornell Univ., Ithaca, N.Y.**STEREOSELECTIVE AMINOACYLATION OF A DINUCLEOSIDE MONOPHOSPHATE BY THE IMIDAZOLIDES OF DL-ALANINE AND N-(TERT-BUTOXYCARBONYL)-DL-ALANINE**

A. T. PROFY and D. A. USHER (Cornell University, Ithaca, NY) *Journal of Molecular Evolution* (ISSN 0022-2844), vol. 20, no. 2, 1984, p. 147-156. refs  
(Contract NIH-GM-26249; NAGW-493; NIH-GM-07273)

The aminoacylation of diinosine monophosphate was studied experimentally. When the acylating agent was the imidazolidine of N-(tert-butoxycarbonyl)-DL-alanine, a 40 percent enantiomeric

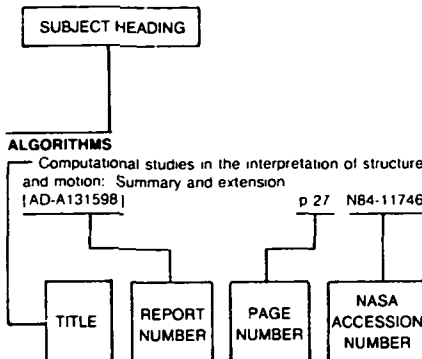
excess of the isomer was incorporated at the 2' site and the positions of equilibrium for the reversible 2'-3' migration reaction differed for the D and L enantiomers. The reactivity of the nucleoside hydroxyl groups was found to decrease on the order 2'(3') less than internal 2' and less than 5', and the extent of the reaction was affected by the concentration of the imidazole buffer. Reaction of lpi with imidazolidine of unprotected DL-alanine, by contrast, led to an excess of the D isomer at the internal 2' site. Finally, reaction with the N-carboxy anhydride of DL-alanine occurred without stereoselection. These results are found to be relevant to the study of the evolution of optical chemical activity and the origin of genetically directed protein synthesis. I.H.

**A84-42500\*** Salk Institute for Biological Studies, San Diego, Calif.**NONENZYMATIC FORMATION OF 'ENERGY-RICH' LACTOYL AND GLYCEROYL THIOESTERS FROM GLYCERALDEHYDE AND A THIOL**

A. L. WEBER (Salk Institute for Biological Studies, San Diego, CA) *Journal of Molecular Evolution* (ISSN 0022-2844), vol. 20, no. 2, 1984, p. 157-166. Previously announced in STAR as N84-26748. refs  
(Contract NSG-7627)

The energy rich thioester, N-acetyl-S-lactoylcysteine, is formed under anaerobic conditions from glyceraldehyde and N-acetylcysteine at ambient temperature in aqueous solutions of sodium phosphate (pH 7.0). The conversion occurs at a rate of about 0.4 percent per day in reactions with 10 millimoles (mM) glyceraldehyde, 40 mM thiol, and 500 mM sodium phosphate (pH 7.0). Thioester formation proceeds at an estimated efficiency of 76 percent. The formation of lactoyl thioester most likely occurs by the phosphate catalyzed dehydration of glyceraldehyde to give pyruvaldehyde, which combines with thiol to form a hemithioacetal that rearranges to the thioester. A second energy rich thioester, N-acetyl-S-glyceroylcysteine, is also produced from glyceraldehyde when these reactions are carried out in the presence of oxygen and to a limited extent in the absence of oxygen. In the presence of oxygen, the formation of glyceroyl thioester continues until the thiol disappears completely by oxidation. The significance of these reactions to the energetics of the origin of life is discussed. M.A.C.

## Typical Subject Index Listing



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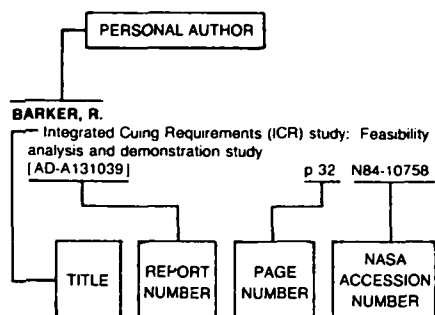
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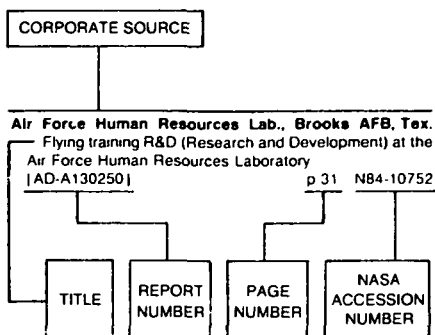
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NOVEMBER 1984

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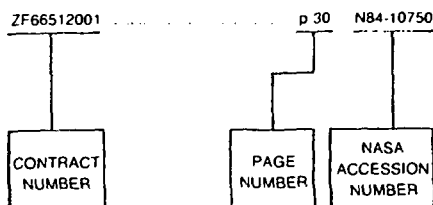
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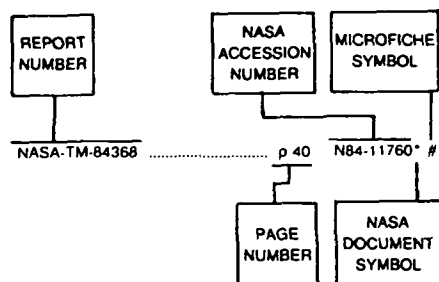
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1. Report No. NASA SP-7011(264)		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology Continuing Bibliography (Supplement 264)				5. Report Date November 1984	
				6. Performing Organization Code	
7. Author(s)				8. Performing Organization Report No.	
9. Performing Organization Name and Address  National Aeronautics and Space Administration Washington, D.C. 20546				10. Work Unit No.	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract  <p>This bibliography lists 365 reports, articles and other documents introduced into the NASA scientific and technical information system in October 1984.</p>					
17. Key Words (Suggested by Author(s))  Aerospace Medicine Bibliographies Biological Effects				18. Distribution Statement  Unclassified - Unlimited	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 106	
				22. Price* \$7.00 HC	

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